STATE OF CALIFORNIA-BUSINESS, TRANSPORTATION AND HOUSING AGENCY GRAY DAVIS, Governor
DEPARTMENT OF TRANSPORTATION
ESC/OE MS #43
1737 30TH. Street 2ND. Floor
SACRAMENTO, CA 945816

December 2, 1999

04-CC,Sol-80-22.0/22.7,0.0/1.8
04-013014

Addendum No. 3

Dear Contractor:

This addendum is being issued to the contract for construction on State highway in CONTRA COSTA AND SOLANO COUNTIES AT CROCKETT AND IN VALLEJO ON ROUTE 80 FROM 1.1 km SOUTH OF U.P.R.R. OVERCROSSING TO 0.4 km NORTH OF ROUTE 80/29 SEPARATION.

Submit bids for this work with the understanding and full consideration of this addendum. The revisions declared in this addendum are an essential part of the contract.

Bids for this work will be opened on January 11, 2000.

This addendum is being issued to revise the Project Plans, the Notice to Contractors and Special Provisions and the Proposal and Contract.

Project Plan Sheets 6, 11, 14, 15, 19, 22, 24, 29, 47, 55, 56, 57, 62, 63, 69, 70, 71, 72, 73, 74, 81, 105, 107, 116, 119, 121, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 137, 161, 171, 173, 174, 178, 179, 180, 182, 183, 184, 186, 193, 196, 211, 212, 216, 235, 236, 239, 246, 333, and 532 thru 582 are revised. Half-sized copies of the revised sheets are attached for substitution for the like-numbered sheets.

Project Plan Sheets 41A, 41B, 222A, 714A, 714B, 714C, 714D, 714E, 714F, 714G, 714H, 714I, 714J, 714K, 714L, 714M, 714N, 714O and 714P are added. Half-sized copies of the added sheets are attached for addition to the project plans.

In the Notice to Contractors and Special Provisions, "Pre-Award Meeting Special Notice", and in Section 3, "Pre-Award Meeting and Award and Execution of Contract", subsection 3-1.01A, "Pre-Award Meeting", the date for the pre-award qualifications review meeting of November 12, 1999 is revised to January 13, 2000.

In the Special Provisions, Section 8-4 "Ultimate Splice Testing", is added as attached.

In the Special Provisions, Section 9, "Description of Bridge Work", is revised as attached.

In the Special Provisions, Section 10-1.01, "Order of Work", the twelfth paragraph is revised as follows:

"A first order of work shall be to relocate facilities at the South Anchorage and to make test borings."

In the Special Provisions, Section 10-1.02, "Water Pollution Control", the second paragraph is revised as follows:

"This project shall conform to the requirements of Permit No.CAS000002 and Permit No. CAS000003 issued by the State Water Resources Control Board. These permits, hereafter referred to as the "Permit," regulates storm water discharges associated with construction activities."

In the Special Provisions, Section 10-1.02, "Water Pollution Control", subsection "Storm Water Pollution Prevention Plan Preparation, Approval and Amendments," the ninth paragraph is deleted.

In the Special Provisions, Section 10-1.02, "Water Pollution Control", subsection "Storm Water Pollution Prevention Plan Preparation, Approval and Amendments," thirteenth paragraph, item 10 is revised as follows:

"10. Copy of the Permits;"

In the Special Provisions, Section 10-1.03, "Non-Storm Water Discharges," subsection "Stockpile Dewater," the third paragraph is revised as follows:

"All water removal from temporary stockpiles shall be handled in accordance with National Pollutant Discharge Elimination System (NPDES) Permits No. CAS000002 and No. CAS000003, hereafter referred to as the "Permit", issued by State Water Resources Control Board. Copies of the Permit, and its amendments will be available for inspection at the Department of Transportation, 111 Grand Avenue, Oakland, Ca. Please call the Toll Bridge Program Duty Senior, Telephone No. (510) 286-5549 or email to duty_senior_tollbridge_district04@dot.ca.gov, to reserve copies at least 24 hours in advance."

In the Special Provisions, Section 10-1.03, "Non-Storm Water Discharges," subsection "Stockpile Dewater," the first sentence of the fourth paragraph is revised as follows:

"The Contractor is responsible for all work, records, reports, and costs involved in handling the water in accordance with the NPDES Permits."

In the Special Provisions, Section 10-1.10, "Cooperation", the following paragraphs are added after the fourth paragraph:

"Excavations at the South Anchorage and Bent 7 Crockett Viaduct shall be backfilled at least to the top of the footing and shoring shall be removed immediately after footing construction is completed, in order to provide access for the construction of the Crockett Viaduct being constructed under a separate contract. In no case shall this backfilling work be completed more than 30 days after the completion of the footings.

No tieback anchors for shoring shall be placed within one meter of the vertical projection of the future location of the footings of Bent 6 Crockett Viaduct being constructed under a separate contract."

In the Special Provisions, Section 10-1.11, "Project Schedule (Critical Path)", is revised as attached.

In the Special Provisions, Section 10-1.27, "Piping and Appurtenances", is revised as attached.

In the Special Provisions, Section 10-1.27A, "Relocation and Construction of C&H Plant Utility Lines", the third paragraph is revised as follows:

"Additional utility work consists of constructing a new 500mm DIP water line to replace the existing EBMUD water line serving the C&H plant. Attention is directed to "Order of Work" of these special provisions for time restrictions in the water line construction work. The Contractor shall request the existing line to be taken out of service by EBMUD and a connection point made ready by EBMUD as indicated on the plans, during a scheduled four-day C&H plant shutdown period. The wet tap for the "Water Line Connection (North) and the new water line shall be installed and tested prior to the shutdown period. Cutting and sealing of the portion of existing line to be removed shall be performed during the shutdown period. The Contractor shall coordinate with EBMUD to develop a work plan and schedule for the shutdown period. The work plan shall provide for all work by EBMUD and the Contractor which must be done during a shutdown of water service to the C&H plant. The Contractor shall submit the work plan and schedule to the Engineer for review four weeks prior to the planned shutdown period."

In the Special Provisions, Section 10-1.27A, "Relocation and Construction of C&H Plant Utility Lines", fifth paragraph, the third sentence is revised as follows:

"Excavation shall be paid for separately as utility excavation (hazardous) and utility excavation (contaminated)."

In the Special Provisions, Section 10-1.27A, "Relocation and Construction of C&H Plant Utility Lines", sixth paragraph, the second sentence is revised as follows:

"Excavation shall be paid for separately as utility excavation (hazardous) and utility excavation (contaminated)."

In the Special Provisions, Section 10-1.31, "Earthwork", the fifth paragraph is revised as follows:

"It is anticipated that the Contractor will encounter areas of hard and intact rock at the North Anchorage that will require fracturing the rock. Blasting by means of explosives shall not be used to fragment the rock."

In the Special Provisions, Section 10-1.31, "Earthwork", subsection "Measurement and Payment (Earthwork)", the thirteenth paragraph and fourteenth paragraph are revised as follows:

"Utilities excavation (hazardous) and (contaminated) shall be measured in the same manner as roadway excavation as specified in the Standard Specifications.

The contract price paid per cubic meter for utilities excavation (hazardous) and (contaminated) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in excavation, bedding required for installation of utility lines, backfilling, and compaction, as shown on the plans, Standard Specifications, these special provisions, and as directed by the Engineer."

In the Special Provisions, Section 10-1.31A, "Contaminated and Hazardous Material Excavation", third paragraph, the first table is revised as follows:

South Anchorage / Bent 7 Crockett Viaduct	
Depth	**Classification**
0 to 1.83 meters	Hazardous
1.83 to 14.1 meters	Contaminated

In the Special Provisions, Section 10-1.31A, "Contaminated and Hazardous Material Excavation", subsection "Measurement and Payment" the first paragraph is revised as follows:

"**MEASUREMENT AND PAYMENT.--**Full compensation for loading, transporting, and disposing of hazardous material shall be considered as included in the contract price paid per cubic yard for structure excavation (Type A) (Class I), structure excavation (Type D) (Class I), roadway excavation (Class I), or utility excavation (Class I) and no additional compensation will be allowed therefor. Full compensation for loading, transporting, and disposing of contaminated material shall be considered as included in the contract price paid per cubic yard for structure excavation (Type A)(Class II), structure excavation (Type D) (Class II), roadway excavation (Class II), or utility excavation (Class II) and no additional compensation will be allowed therefor. (Class I) shall mean (hazardous) and (Class II) shall mean contaminated."

In the Special Provisions, Section 10-1.31A, "Contaminated and Hazardous Material Excavation", subsection "Measurement and Payment" the following paragraph is added after the first paragraph:

"(Class I) shall mean (hazardous) and (Class II) shall mean contaminated."

In the Special Provisions, Section 10-1.47, "Prestressing Concrete", the following paragraph is added after the second paragraph:

"When acceptable prestressing steel for post-tensioning is installed in the ducts after completion of concrete curing, and if stressing and grouting are completed within 5 days after the installation of the pre-stressing steel, rust which may form during said 5 days will not be cause for rejection of the steel. Prestressing steel installed, tensioned and grouted in this manner, all within 5 days, will not require the use of a corrosion inhibitor in the duct following installation of the prestressing steel. Prestressing steel installed as above but not grouted within 5 days shall be subject to all the requirements in this section pertaining to corrosion protection and rejection because of rust."

In the Special Provisions, Section 10-1.48, "Concrete Structures", is revised as attached.

In the Special Provisions, Section 10-1.56, "Steel Structures", subsections "Fabrication (Orthotropic Box Girder)" and "Erection (Orthotropic Box Girder)", are revised as attached.

In the Special Provisions, Section 10-1.57, "Maintenance Travelers", subsection "Non-destructive testing of the welds" is revised as follows:

"**Non-destructive testing of the welds.—**All fillet welds on components and attachments to the traveler truck, trolley units, and safety support devices shall be 100 percent magnetic particle tested. All complete penetration groove welds shall be 100 percent radiographically or ultrasonically tested in accordance with the requirements of AWS D1.5, Section 6.7.1. The fabricator shall submit testing procedures to the Engineer for review, and shall not proceed with the testing until the Engineer has approved the procedures."

In the Special Provisions, Section 10-1.89, "Bridge Deck Drainage System", is revised as attached.

In the Special Provisions, Section 10-3.18, "High Voltage Power Cable", subsection "Insulation", the third sentence of the first paragraph is revised as follows:

"The manufacturer shall perform the Insulation Corona Discharge Resistance Test (see Section 3.9.3.3 of the ICEA S-68-518) tested in accordance with the method described in ASTM D2275-89 "Standard Test Method for Voltage Endurance of Solid Electrical insulating materials Subjected to Partial Discharges (Corona) on the Surface" and submit the result to the Engineer before excepting of the cable."

In the Special Provisions, Section 10-3.51, "Unit Substation Transformer" subsection "Training" the first sentence of the first paragraph is revised as follows:

"The Contractor shall provide a training session for up to 12 owners' representative for 10 normal workdays at a jobsite location determined by the state."

In the Special Provisions, Section 10-3.53, "Low-Voltage Distribution Switchboard", subsection "Bus", the first sentence of the first paragraph is revised as follows:

"All bus bars shall be silver-plated copper."

In the Special Provisions, Section 10-3.65, "Power Meter Type 1", third paragraph, second table, the last row is revised as follows:

Inputs/Outputs	Three form C relay output selectable: Alarm #1. Alarm #2 (alarm #1 and alarm #2 contacts are connected to the FCS #1 as shown on the plans), kWHR pulse initiator.

In the Special Provisions, Section 10-3.65, "Power Meter Type 1", the fourth paragraph is revised as follows:

"The Contractor shall install all the necessary CT's (split core ANSI Metering Accuracy) and PT's for proper operation of the meter as per manufacture recommendation. The contractor shall connect the power meter type 1 to the CT's and/or PT's and all necessary electrical equipment with all necessary cables and conductors to perform all functions specified in these special provisions."

In the Special Provisions, Section 10-3.66, "Power Meter Type 2", first paragraph, item "e." is revised as follows:

"e. The Contractor shall install all necessary CT's (split core ANSI Metering Accuracy) and PT's for proper operation of the meter as per manufacture recommendation. The contractor shall connect the power meter type 2 to the CT's and/or PT's and all necessary electrical equipment with all necessary cables and conductors to perform all functions specified in these special provisions."

In the Special Provisions, Section 10-3.67, "Power Meter Type 3", first paragraph, item "e." is revised as follows:

"e. The Contractor shall install all the necessary CT's (split core ANSI Metering Accuracy) and PT's for proper operation of the meter as per manufacture recommendation. The Contractor shall connect the power meter type 3 to the CT's and/or PT's and all necessary electrical equipment with all necessary cables and conductors to perform all functions specified in these special provisions."

In the Special Provisions, Section 10-3.69, "Breaker Interface Module (BIM)", the following sentence is added after the fourth sentence of the third paragraph:

"The Contractor shall connect the BIM to the circuit breaker type A and B and the main circuit breaker with all necessary cables and conductors to perform all functions specified in these special provisions."

In the Special Provisions, Section 10-3.70, "Low-Voltage Control Center (LVCC)" subsection "Bus", the first sentence of the first paragraph is revised as follows:

"Each structure shall contain a main horizontal silver-plated copper bus, with minimum ampacity of 600 amperes or rated 800 amperes as shown on the plans."

In the Special Provisions, Section 10-3.72, "Automatic Transfer Switch (ATS)", the first sentence of the first paragraph is revised as follows:

"The automatic transfer switch shall have the capability for transfer of load between utility and motor-generator."

In the Special Provisions, Section 10-3.98, "Ground Well", subsection "Electrolytic Grounding System", item A is revised as follows:

"A. Shaft configuration: Straight-shaped. Standard lengths: as shown in the plans."

In the Special Provisions, Section 10-3.98, "Ground Well", subsection "Execution," under "Installation, A. General", item No. 1 is revised as follows:

"1. To achieve specific earth resistance, contact the manufacturer for engineering design assistance. Preliminary step in grounding design requires a "Wenner four-point" soil resistively test be performed on the earth at the job site."

In the Special Provisions, Section 10-3.103, "Manuals", item No. 9 of the first paragraph is revised as follows:

"9. Circuit Breaker Type A and B."

In the Special Provisions, Section 10-3.103, "Manuals", the following item is added:

"16. Main Circuit Breaker"

In the Special Provisions, Section 10-1.45, "Piling", third paragraph, the Foundation Geotechnical Report has been revised and is available for the Contractor's inspection at the Department of Transportation, Duty Senior's Desk as stated in the above-referenced section.

A supplemental Materials Handout for foundation work at Bent 7 of Crockett Viaduct is available at the Department of Transportation, Duty Senior's Desk, 111 Grand Avenue, Oakland, California, Telephone No. (510) 286-5549.

In the "Proposal and Contract", "Pre-Award Meeting Special Notice", the date for the pre-award qualifications review meeting of November 12, 1999 is revised to January 13, 2000.

In the Proposal and Contract, the Engineer's Estimate Items 31, 45, 46, 47, 48, 60, 65, 67, 94, 119, 120, 131, 181, 185, 202, 203 and 256 are revised, Items 257, 258, 259, 260, 261, 262 and 263 are added and Item 66 is deleted as attached.

To Proposal and Contract book holders:

- REPLACE THE ENTIRE ENGINEER'S ESTIMATE IN THE PROPOSAL WITH THE ATTACHED ENGINEER'S ESTIMATE. THE REVISED ENGINEER'S ESTIMATE IS TO BE USED IN THE BID.
- INDICATE RECEIPT OF THIS ADDENDUM BY FILLING IN THE NUMBER OF THIS ADDENDUM IN THE SPACE PROVIDED ON THE SIGNATURE PAGE OF THE PROPOSAL.
- Submit bids in the Proposal and Contract book you now possess. Holders who have already mailed their book will be contacted to arrange for the return of their book.
- Inform subcontractors and suppliers as necessary.

This office is sending this addendum by UPS overnight mail to Proposal and Contract book holders to ensure that each receives it.

If you are not a Proposal and Contract book holder, but request a book to bid on this project, you must comply with the requirements of this letter before submitting your bid.

Sincerely,

ORIGINAL SIGNED BY

NICK YAMBAO, Chief
Office of Plans, Specifications & Estimates
Division of Office Engineer

Attachments

SECTION 8-4. ULTIMATE SPLICE TESTING

8-4.01 BAR REINFORCEMENT SPLICE TESTING (ULTIMATE BUTT SPLICES)

Ultimate butt splices and the testing of these splices shall conform to the provisions in "Reinforcement" of these special provisions and the requirements herein.

The length of any type of ultimate mechanical butt splice shall not exceed 10 times the bar diameter of the bar to be spliced.

Ultimate butt splices shall be used at the following locations:

ULTIMATE BUTT SPLICE LOCATIONS

Location No.	Bridge No.	Portion of Structure	Bar Size	Bar Description
1	28-0367L	Bent 7 Columns	No. 25	hoops
2	28-0367L	Bent 7 Columns	No. 32	Main column reinforcement

The independent qualified testing laboratory used to perform the testing of all ultimate butt sample splices and control bars shall not be employed or compensated by any subcontractor, or by other persons or entities hired by subcontractors, who will provide other services or materials for the project and shall have the following:

1. Proper facilities, including a tensile testing machine capable of breaking the largest size of bar to be tested.
2. A device for measuring the total slip of the reinforcing bars within the splice to the nearest 25 µm. This device shall be placed parallel to the longitudinal axis of the bar and shall be able to simultaneously measure movement on both sides of the splice.
3. Operators who have received formal training for performing the testing requirements of ASTM Designation: A 370/A 370M and California Test 670.
4. A record of annual calibration of testing equipment. The calibration shall be performed by an independent third party that has 1) standards that are traceable to the National Institute of Standards and Technology and 2) a formal reporting procedure, including published test forms.

The Contractor shall designate in writing an ultimate butt splicing Quality Control Manager (QCM). The QCM shall be responsible directly to the Contractor for the quality of all ultimate butt splicing, including materials and workmanship, performed by the Contractor and all subcontractors.

The QCM shall not be employed or compensated by any subcontractor, or by other persons or entities hired by subcontractors, who will provide other services or materials for the project. The QCM may be an employee of the Contractor.

The QCM shall be the sole individual responsible to the Contractor for submitting, receiving, and approving all correspondence, required submittals, and reports regarding ultimate butt splicing to and from the Engineer.

Whenever any lot of ultimate butt splices is rejected, no additional ultimate butt splices shall be placed until the QCM performs a complete review of the Contractor's quality control process and submits written evidence, acceptable to the Engineer, that all remaining splices in this lot conform to the specifications.

Sample splices shall be 1) a minimum length of 1.5 meters for reinforcing bars No. 25 or smaller and 2 meters for reinforcing bars No. 29 or larger, with the splice located at mid-point, and 2) suitably identified prior to shipment with weatherproof markings that do not interfere with the Engineer's tamper-proof markings or seals.

A minimum of one control bar shall be removed from the same bar as, and adjacent to, each sample splice. Control bars shall be 1) a minimum length of one meter for reinforcing bars No. 25 or smaller and 1.5 meters for reinforcing bars No. 29 or larger, and 2) suitably identified prior to shipment with weatherproof markings that do not interfere with the Engineer's tamper-proof markings or seals. The portion of adjacent bar remaining in the work shall also be identified with weatherproof markings that correspond to its adjacent control bar.

Shorter length sample splice and control bars may be furnished if approved in writing by the Engineer.

Each sample splice and its associated control bar shall be identified and marked as a set. Each set shall be identified as representing either a prequalification, production, or job control sample splice.

The portion of hoop reinforcing bar, removed to obtain a sample splice and control bar, shall be repaired using a prequalified ultimate mechanical butt splice or the hoop shall be replaced in kind.

Reinforcing bars, other than hoops, from which sample splices are removed shall be repaired using prequalified ultimate mechanical butt splices or the bars shall be replaced in kind. These bars shall be repaired or replaced such that no splices are located in the "No Splice Zone" shown on the plans.

Section 52-1.08E, "Job Control Tests," of the Standard Specifications shall not apply.

ULTIMATE BUTT SPLICE TEST CRITERIA.— Ultimate prequalification, production, and job control sample splices shall be tensile tested in conformance with the requirements described in ASTM Designation: A 370/A 370M and California Test 670.

Ultimate prequalification and production sample splices shall rupture in the reinforcing bar either: 1) outside of the affected zone or 2) within the affected zone, provided that the sample has achieved at least 95 percent of the ultimate tensile strength of the control bar associated with the sample. In addition, necking of the bar shall be visibly evident at rupture regardless of whether the bar breaks inside or outside the affected zone.

The affected zone is the portion of the reinforcing bar where any properties of the bar, including the physical, metallurgical, or material characteristics, have been altered by fabrication or installation of the splice.

The ultimate tensile strength of each control bar shall be determined by tensile testing the bar to rupture. If 2 control bars are tested for one sample splice, the bar with the lower ultimate tensile strength shall be considered the control bar.

Testing to determine the minimum tensile strength, in conformance with the provisions in the ninth paragraph of Section 52-1.08, "Splicing," of the Standard Specifications, will not be required.

PREQUALIFICATION TEST REQUIREMENTS FOR ULTIMATE BUTT SPLICES.—Prior to use in the work, all welded and mechanical ultimate butt splices shall conform to the following prequalification test requirements:

Four prequalification sample splices for each splice type, including ultimate mechanical butt splices, ultimate complete joint penetration butt welded splices, and ultimate resistance butt welded splices that will be used in the work, shall be fabricated by the Contractor and furnished to the Engineer for testing. In addition, for sleeve-filler metal, sleeve-swaged, sleeve-extruded, sleeve-filler grout, and sleeve-lockshear bolt types of couplers, 4 sample prequalification splices shall be fabricated for each bar deformation pattern that will be used in the work.

If different diameters of hoop reinforcement are shown on the plans, prequalification sample splices, as described above, will only be required for the smallest hoop diameter. In addition, these splices shall be fabricated using the same radius as shown on the plans for said hoops.

Unless otherwise directed in writing by the Engineer, all prequalification sample splices and control bar sets shall be shipped to the Office of Materials Engineering and Testing Services, 5900 Folsom Boulevard, Sacramento, CA 95819, telephone (916) 227-7251.

The 4 sets from each prequalification test shall be securely bundled together and identified by location and contract number with weatherproof markings prior to shipment. Bundles containing fewer than 4 sets will not be tested.

All 4 sample splices from each prequalification test shall conform to the provisions in "Ultimate Butt Splice Test Criteria" specified herein, and Section 52-1.08C, "Mechanical Butt Splices," of the Standard Specifications.

Test results for each bundle of 4 sets will be reported in writing to the Contractor within 10 working days after receipt of the bundle by the Office of Materials Engineering and Testing Services. In the event that more than one bundle is received on the same day, 2 additional calendar days shall be allowed for providing test results for each additional bundle received. A test report will be made for each bundle received.

Should the Engineer fail to provide the test results within this time allowance and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in providing the test results, the delay will be considered a right of way delay in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

PRODUCTION TEST REQUIREMENTS FOR ULTIMATE BUTT SPLICES.—Production tests shall be performed for all welded and mechanical ultimate butt splices used in the work. A production test shall consist of 4 sets of sample splices and control bars removed from each lot of completed splices.

A lot of hoop reinforcing bars at location No. 1 is defined as 1) 150, or fraction thereof, of the same type of ultimate mechanical butt splices used for each bar size and each bar deformation pattern that is used in the work at said location or 2) 150, or fraction thereof, of ultimate complete joint penetration butt welded splices, or ultimate resistance butt welded splices for each bar size used in the work at said location.

For reinforcement at location No. 2, a lot is defined as 1) 150, or fraction thereof, of the same type of ultimate mechanical butt splices used for each bar size and each bar deformation pattern that is used in the work at said location or 2) 150, or fraction thereof, of ultimate complete joint penetration butt welded splices, or ultimate resistance butt welded splices for each bar size used in the work at said location.

After all splices in a lot have been completed, the QCM shall notify the Engineer in writing that all couplers in said lot conform to the specifications and are ready for testing. After notification has been received, the Engineer will select the 4 sample splices to be removed from the lot and place tamper-proof markings or seals on them. The Contractor or QCM shall select the adjacent control bar for each sample splice bar and the Engineer will place tamper-proof markings or seals on them. These ultimate production sample splices and control bars shall be removed by the Contractor, and tested by an independent qualified testing laboratory, both in the presence of the Engineer or the Engineer's authorized representative.

The Engineer or the Engineer's authorized representative will be at the independent qualified testing laboratory within a maximum of 5 working days after receiving written notification that the samples are at the laboratory and ready for testing. Should the Engineer or the Engineer's authorized representative fail to be at the laboratory within this time allowance, and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of this action, the delay will be considered a right of way delay in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

A sample splice or control bar from any set will be rejected if any tamper-proof marking or seal is disturbed prior to testing.

The 4 sets from each production test shall be securely bundled together and identified with a completed sample identification card prior to shipment to the independent laboratory. The card will be furnished by the Engineer. Bundles containing fewer than 4 sets shall not be tested.

A Test Report for all testing performed on each lot shall be prepared by the independent testing laboratory performing the testing and submitted to the QCM for review and approval. The report shall be signed by an engineer, who represents the laboratory, and is registered as a Civil Engineer in the State of California. The report shall include, as a minimum, the following information for each set: contract number, bridge number, lot number and location, bar size, type of splice, length of mechanical splice, physical condition of test sample splice and control bar, any notable defects, limits of affected zone, total measured slip, location of visible necking area, ultimate strength of each splice, ultimate strength and 95 percent of this ultimate strength for each control bar, and a comparison between 95 percent of the ultimate strength of each control bar and the ultimate strength of its associated splice.

The QCM must review, approve and forward each Test Report to the Engineer for review before any splices represented by the report are encased in concrete. The Engineer shall have 3 working days to review each Test Report and respond in writing after a complete report has been received. Should the Contractor elect to encase any splices prior to receiving notification from the Engineer, it is expressly understood that the Contractor will not be relieved of the Contractor's responsibility for incorporating material in the work that conforms to the requirements of the plans and specifications. Any material not conforming to these requirements will be subject to rejection. Should the Contractor elect to wait to encase any splices pending notification by the Engineer, and should the Engineer fail to complete the review and provide notification within this time allowance, and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in notification, the delay will be considered a right of way delay in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

Prior to performing any tensile tests on production test sample splices, one of the 4 samples shall be tested for, and shall conform to, the provisions for total slip specified in Section 52-1.08C, "Mechanical Butt Splices," of the Standard Specifications. Should this sample not meet these requirements, one retest, in which the 3 remaining samples are tested for total slip, will be allowed. Should any of these 3 samples not conform to said requirements, all splices in the lot represented by said production test will be rejected.

Should more than one sample splice from any production test fail to conform to the requirements of "Ultimate Butt Splice Test Criteria" specified herein, additional production tests shall be performed until at least 75 percent of the cumulative total of all individual sample splices tested in each lot conforms to said requirements.

If a production test for any lot fails, the Contractor will be required to repair or replace all reinforcing bars from which sample splices were removed, complete in place, before the Engineer selects any additional splices from said lot for further testing.

Production tests will not be required on any repaired splice from a lot, regardless of the type of prequalified ultimate mechanical butt splice used to make the repair, once a production test is successful.

Should additional production tests be required, any repaired splice may be selected by the Engineer for use in the additional production tests

If a splice type other than the kind used to make the original splice is used to make a repair splice, and if more than one additional production test is required for a lot represented by these splices, these splices shall be considered a separate lot for the purposes of performing production tests.

QUALITY ASSURANCE TEST REQUIREMENTS FOR ULTIMATE BUTT SPLICES.— For the first production test performed, and for at least one, randomly selected by the Engineer, of every 5 additional production tests, or portion thereof, performed thereafter, the Contractor shall concurrently prepare 4 additional ultimate job control sample splices along with associated control bars. These ultimate job control samples shall be prepared in the same manner as specified herein for ultimate prequalification sample splices and control bars.

Each time 4 additional ultimate job control sample splices are prepared, 2 of these job control sample splice and associated control bar sets and 2 of the production sample splice and associated control bar sets, together, shall conform to the requirements for ultimate production sample splices in "Production Test Requirements for Ultimate Butt Splices" specified herein.

The 2 remaining job control sample splice and associated control bar sets, along with the 2 remaining production sample splice and associated control bar sets shall be shipped, unless otherwise directed in writing by the Engineer, to the Office of Materials Engineering and Testing Services, 5900 Folsom Boulevard, Sacramento, CA 95819, telephone (916) 227-7251 for quality assurance testing. The 4 sets shall be securely bundled together and identified by location and contract number with weatherproof markings prior to shipment. Bundles containing fewer than 4 sets will not be tested.

Quality assurance testing will be performed to verify that the splices conform to the provisions in "Ultimate Butt Splice Test Criteria" specified herein and Section 52-1.08C, "Mechanical Butt Splices," of the Standard Specifications. Should more than one sample splice from any quality assurance test fail to conform to these requirements, all splices in the lot represented by the test will be rejected.

Test results for each bundle of 4 sets will be reported in writing to the Contractor within 3 working days after receipt of the bundle by the Office of Materials Engineering and Testing Services. In the event that more than one bundle is received on the same day, one additional calendar day shall be allowed for providing test results for each additional bundle received. A test report will be made for each bundle received. Should the Contractor elect to encase any splices prior to receiving notification from the Engineer, it is expressly understood that the Contractor will not be relieved of the Contractor's responsibility for incorporating material in the work that conforms to the requirements of the plans and specifications. Any material not conforming to these requirements will be subject to rejection. “Should the Contractor elect to wait to encase any splices pending notification by the Engineer, and should the Engineer fail to complete the review and provide notification within this time allowance, and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in notification, the delay will be considered a right of way delay in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

MEASUREMENT AND PAYMENT.— Full compensation for conforming to all of the requirements of this section, Bar Reinforcement Splice Testing (Ultimate Butt Splices), shall be considered as included in the contract prices paid for the various contract items of work involved and no additional compensation will be allowed therefor.

SECTION 9. DESCRIPTION OF BRIDGE WORK

The bridge work to be done consists, in general, of constructing the following structures, as shown on the plans:

Carquinez Bridge and Overhead
(Bridge No. 28-0352L)

Crockett Viaduct (Bent 7)
(Bridge No. 28-0367L)

10-1.11 PROGRESS SCHEDULE (CRITICAL PATH)

Progress schedules will be required for this contract. Progress schedules shall utilize the Critical Path Method (CPM).

Definitions - The following definitions apply to this section "Progress Schedule (Critical Path)":

1) Activity: Any task, or portion of a project, which takes time to complete.
2) Baseline Schedule: The initial CPM schedule representing the Contractor's original work plan, as accepted by the Engineer.
3) Controlling Operation: The activity considered at the time by the Engineer, within that series of activities defined as the critical path, which if delayed or prolonged, will delay the time of completion of the contract.
4) Critical Path: The series of activities, which determines the earliest completion of the contract (Forecast Completion Date).
5) Critical Path Method: A mathematical calculation to determine the earliest completion of the contract represented by a graphic representation of the sequence of activities that shows the interrelationships and interdependencies of the elements composing a project.
6) Current Contract Completion Date: The extended date for completion of the contract shown on the weekly statement of working days furnished by the Engineer in accordance with Section 8-1.06, "Time of Completion," of the Standard Specifications.
7) Early Completion Time: The difference in time between the current contract completion date and the Contractor's scheduled early forecast completion date as shown on the accepted baseline schedule, or schedule updates and revisions.
8) Float: The amount of time between the early start date and the late start date, or the early finish date and the late finish date, of any activity or group of activities in the network.
9) Forecast Completion Date: The completion date of the last scheduled work activity identified on the critical path.
10) Fragnet: A section or fragment of the network diagram comprised of a group of activities.
11) Free Float: The amount of time an activity can be delayed before affecting a subsequent activity.
12) Hammock Activity: An activity added to the network to span an existing group of activities for summarizing purposes.
13) Milestone: A marker in a network, which is typically used to mark a point in time or denote the beginning or end of a sequence of activities. A milestone has zero duration, but will otherwise function in the network as if it were an activity.
14) Revision: A change in the future portion of the schedule that modifies logic, adds or deletes activities, or alters activities, sequences, or durations.
15) Tabular Listing: A report showing schedule activities, their relationships, durations, scheduled and actual dates, and float.
16) Total Float: The amount of time that an activity may be delayed without affecting the total project duration of the critical path.
17) Update: The modification of the CPM progress schedule through a regular review to incorporate actual progress to date by activity, approved time adjustments, and projected completion dates.
18) Time Scaled Logic Diagram: A schematic display of the logical relationships of project activities, drawn from left to right to reflect project chronology with the positioning and length of the activity representing its duration.
19) Bar Chart (Gantt Chart): A graphic display of scheduled-related information, activities or other project elements are listed down the left side of the chart, date are shown across the top, and activity durations are shown as date-placed horizontal bars.

Pre-construction Scheduling Conference - The Engineer shall schedule and conduct a Preconstruction Scheduling Conference with the Contractor's Project Manager and Construction Scheduler within seven days after the bidder has received the contract for execution. At this meeting, the requirements of this section of the special provisions will be reviewed with the Contractor. The Contractor shall be prepared to discuss its schedule methodology, proposed sequence of operations, the activity identification system for labeling all work activities, the schedule file numbering system, and any deviations it proposes to make from the Stage Construction Plans. The Engineer shall submit a diskette of a scheduling shell project, displaying an activity code dictionary consisting of fields populated with the Caltrans Scope Breakdown Structure Code. The Contractor shall utilize these codes, and may add other codes as necessary, to group and organize the work activities. Periodically the Engineer may request the Contractor to utilize additional filters, layouts or activity codes to be able to further group or summarize work activities.

Also, the Engineer and the Contractor shall review the requirements for all submittals applicable to the contract and discuss their respective preparation and review durations. All submittals and reviews are to be reflected on the Interim Baseline Schedule and the Baseline Schedule.

Interim Baseline Schedule - Within 15 days after approval of the contract, the Contractor shall submit to the Engineer an Interim Baseline Project Schedule which will serve as the progress schedule for the first 120 days of the project, or until the Baseline Schedule is accepted, whichever is sooner. The Interim Baseline Schedule shall utilize the critical path method. The Interim Baseline Schedule shall depict how the Contractor plans to perform the work for the first 120 days of the contract. Additionally, the Interim Baseline Schedule shall show all submittals required early in the project, and shall provide for all permits, and other non-work activities necessary to begin the work. The Interim Baseline Schedule submittal shall include a 3 l/2 inch floppy diskette which contains the data files used to generate the schedule.

The Engineer shall be allowed 10 days to review the schedule and to provide comments, including the Contractor's application of the supplied scope breakdown structure. The Interim Baseline Schedule does not require Caltrans approval but all comments are to be implemented into the Baseline Schedule. Re-submittal of the Interim Baseline Schedule is not required. Late review of the Interim Baseline Schedule shall not restrain the submittal of the Baseline Schedule.

Baseline Schedule - Within 30 days, after approval of the contract, the Contractor shall submit to the Engineer a Baseline Project Schedule including the incorporation of all comments provided to the Interim Baseline Schedule. The Baseline Schedule shall have a data date of the day prior to the first working day of the contract. The schedule shall not include any actual start dates, actual finish dates, or constraint dates. The Baseline Progress Schedule shall meet interim milestone dates, contract milestone dates, stage construction requirements, internal time constraints, show logical sequence of activities, and must not extend beyond the number of days originally provided for in the contract.

All task activities shall be assigned to a project calendar. Each calendar shall identify a workweek, and holidays. Use different calendars for work activities that occur on different work schedules.

The Contractor shall not add job inefficiencies or weather days to a project calendar without prior approval by the Engineer.

The Baseline CPM Schedule submitted by the Contractor shall have a sufficient number of activities to assure adequate planning of the project and to permit monitoring and evaluation of progress and the analysis of time impacts. The Baseline Schedule shall depict how the Contractor plans to complete the whole work involved, and shall show all activities that defines the critical path. Each construction activity shall have durations of not more than 20 working days, and not less than one working day unless permitted otherwise by the Engineer. All activities in the schedule, with the exception of the first and last activities, shall have a minimum of one predecessor and a minimum of one successor.

The Baseline Schedule shall not attribute negative float to any activity. Float shall not be considered as time for the exclusive use of or benefit of either the State or the Contractor but shall be considered as a jointly owned, expiring resource available to the project and shall not be used to the financial detriment of either party. Any accepted schedule, revision or update having an early completion date shall show the time between the early completion date and the current Contract Completion Date as "total float".

The Contractor shall be responsible for assuring that all work sequences are logical and the network shows a coordinated plan for complete performance of the work. Failure of the Contractor to include any element of work required for the performance of the contract in the network shall not relieve the Contractor from completing all work within the time limit specified for completion of the contract. If the Contractor fails to define any element of work, activity or logic, the Contractor in the next monthly update or revision of the schedule shall correct it.

The Baseline Progress Schedule shall be supplemented with resource allocations for every task activity to a level of detail that facilitates report generation based on labor craft and equipment class for the Contractor and subcontractors. The Contractor shall use average composite crews to display the labor loading of on-site construction activities. The Contractor shall optimize and level labor to reflect a reasonable plan for accomplishing the work of the contract and to assure that resources are not duplicated in concurrent activities. Along with the baseline progress schedule, the Contractor shall also submit to the Engineer time-scaled resource histograms of the labor crafts and equipment classes to be utilized on the contract.

The Contractor shall not create hammock activities for the purpose of resources loading.

The Contractor shall require each subcontractor to submit in writing a statement certifying that the subcontractor has concurred with the Contractor's CPM, including major updates, and that the subcontractor's related schedule has been incorporated accurately, including the duration of activities, labor and equipment loading. Should the Baseline Schedule or schedule update, submitted for acceptance, show variances from the requirements of the contract, the Contractor shall make specific mention of the variations in the letter of transmittal, in order that, if accepted, proper adjustments to the project schedule can be made. The Contractor will not be relieved of the responsibility for executing the work in strict accordance with the requirements of the contract documents. In the event of a conflict between the requirements of the contract documents and the information provided or shown on an accepted schedule, the requirements of the contract documents shall take precedence.

Each schedule submitted to the Engineer shall comply with all limits imposed by the contract, with all specified intermediate milestone and contract completion dates, and with all constraints, restraints or sequences included in the contract. The degree of detail shall include factors including, but not limited to:

1) Physical breakdown of the project;
2) Contract milestones and completion dates, substantial completion dates, constraints, restraints, sequences of work shown in the contract, the planned substantial completion date, and the final completion date;
3) Type of work to be performed, the sequences, and the major subcontractors involved;
4) All purchases, submittals, submittal reviews, manufacture, fabrication, tests, delivery, and installation activities for all major materials and equipment.
5) Preparation, submittal and approval of shop and working drawings and material samples, showing time, as specified elsewhere, for the Engineer's review. The same time frame shall be allowed for at least one resubmittal on all major submittals so identified in the contract documents;
6) Identification of interfaces and dependencies with preceding, concurrent and follow-on contractors, railroads, and utilities as shown on the plans or specified in the specifications;
7) Identification of each and every utility relocation and interface as a separate activity, including activity description and responsibility coding that identifies the type of utility and the name of the utility company involved.
8) Actual tests, submission of test reports, and approval of test results;
9) All start-up, testing, training, and assistance required under the Contract;
10) Punchlist and final clean-up;
11) Identification of any manpower, material, or equipment restrictions, as well as any activity requiring unusual shift work, such as double shifts, 6-day weeks, specified overtime, or work at times other than regular days or hours; and
12) Identification of each and every ramp closing and opening event as a separate one-day activity, including designation by activity coding and description that it is a north-bound, south-bound, east-bound, west-bound, and entry or exit ramp activity.

The Baseline Schedule submittal shall include a 3 l/2 inch floppy diskette which contains the data files used to generate the schedule, a schedule narrative describing the critical path, and all schedule reports.

The Engineer shall be allowed 15 days to review and accept or reject the baseline project schedule submitted. Rejected schedules shall be resubmitted to the Engineer within 5 days, at which time a new 15 day review period by the Engineer will begin.

Project Schedule Reports - Schedules submitted to the Engineer including Interim Baseline, Baseline, and update schedules shall include time scaled network diagrams in a layout format requested by the Engineer. The network diagrams submitted to the Engineer shall also be accompanied by four computer-generated mathematical analysis tabular reports for each activity included in the project schedule. The reports (8 1/2" x 11" size) shall include a network diagram report showing the activity columns only, a predecessor and successor report, a resource report (Interim Baseline and Baseline Schedules), and a scheduling and leveling calculation report. The network diagram report~~s~~ shall include, at a minimum, the following for each activity:

1) Activity number and description;
2) Activity codes;
3) Original, actual and remaining durations;
4) Early start date (by calendar date);

7) Early finish date (by calendar date);
8) Actual start date (by calendar date);
9) Actual finish date (by calendar date);
10) Late start date (by calendar date);
11) Late finish date (by calendar date);
12) Identify activity calendar ID;
14) Total Float and Free Float, in work days and;
15) Percentage complete.

Network diagrams shall be sorted and grouped in a format requested by the Engineer reflecting the project breakdown per the Caltrans scope breakdown structure codes. They shall show a continuous flow of information from left to right per the project sorting and grouping codes. E.g., project milestones, submittals sub-grouped by description, and the construction activities sub-grouped by the scope breakdown structure. The primary paths of criticality shall be clearly and graphically identified on the networks. The network diagram shall be prepared on E-size sheets (36" x 48"), shall have a title block in the lower right-hand corner, and a timeline on each page. Exceptions to the size of the network sheets and the use of computer graphics to generate the networks shall be subject to the approval of the Engineer.

Schedule network diagrams the tabular reports shall be submitted to the Engineer for acceptance in the following quantities:

a) 2 sets of the Network Diagrams;
b) 2 copies of the tabular reports (8 1/2" x 11" size); and
c) 3 computer diskettes.

Weekly Schedule Meetings - The Engineer and the Contractor shall hold weekly scheduling meetings to discuss the near term schedule activities, to address any long-term schedule issues, and to discuss any relevant technical issues. The Contractor shall develop a rolling 4-week schedule identifying the previous week worked and a 3-week look ahead. It shall provide sufficient detail to address all activities to be performed and to identify issues requiring engineering action or input.

Monthly Update Schedules - The Contractor shall submit a Monthly Update Schedule to the Engineer once in each month within 5 days of the data date. The proposed update schedule prepared by the Contractor shall include all information available as of the 20th calendar day of the month, or other data date as established by the Engineer. A detailed list of all proposed schedule changes such as logic, duration, lead/lag, forecast completion date, additions and deletions shall be submitted with the update.

The monthly update of the schedule shall focus on the period from the last update to the current cut-off data date. Changes to activities or logic beyond the data date are classified as revisions and need to be addressed per the schedule revision section of this specification. Activities that have either started or finished shall be reported as they actually occurred and designated as complete, if actually completed. For activities in progress that are forecasted to complete longer than planned, the remaining durations shall be revised, not the original durations. All out of sequence activities are to be reviewed and their relationships either verified or changed.

The Monthly Update Schedule submitted to the Engineer shall be accompanied by a Schedule Narrative Report. The report shall describe the physical progress during the report period, plans for continuing the work during the forthcoming report period, actions planned to correct any negative float, and an explanation of potential delays or problems and their estimated impact on performance, milestone completion dates, forecast completion date, and the overall project completion date. In addition, alternatives for possible schedule recovery to mitigate any potential delay or cost increases shall be included for consideration by the Engineer. The report shall follow the outline set forth below:

Contractor's Schedule Narrative Report Outline:

1) Contractor's Transmittal Letter
2) Work completed during the period
3) Description of the current critical path
4) Description of problem areas
5) Current and anticipated delays
    a) Cause of the delay
    b) Corrective action and schedule adjustments to correct the delay
    c) Impact of the delay on other activities, milestones, and completion dates

6) Changes in construction sequences
7) Pending items and status thereof
    a) Permits
    b) Change Orders
    c) Time Extensions
    d) Non-Compliance Notices
8) Contract completion date(s) status
    a) Ahead of schedule and number of days
    b) Behind schedule and number of days
9) Include updated Network Diagram and Reports

The Contractor shall provide to the Engineer a 3 1/2" electronic disk of the schedule, together with printed copies of the network diagrams and tabular reports described under "Project Schedule Reports", and the Schedule Narrative Report.

Portions of the network diagram on which all activities are complete need not be reprinted and submitted in subsequent updates. However, the electronic disk file of the submitted schedule and the related reports shall constitute a clear record of progress of the work from award of contract to final completion.

On a date determined by the Engineer, the Contractor shall meet with the Engineer to review the monthly schedule update. At the monthly progress meeting, the Contractor and the Engineer shall review the updated schedule and shall discuss the content of the Narrative Report. The Engineer shall be allowed 10 days after the meeting to review and accept or reject the update schedule submitted. Rejected schedules shall be resubmitted to the Engineer within 5 days, at which time a new 5 day review period by the Engineer will begin. All efforts shall be made between the Engineer and the Contractor to complete the review and the approval process prior to the next update schedule cutoff date. To expedite the process a second meeting between the Engineer and the Contractor shall be held.

Schedule Revisions - If the Contractor desires to make a change to the accepted schedule, the Contractor shall request permission from the Engineer in writing, stating the reasons for the change, and proposed revisions to activities, logic and duration. The Contractor shall submit for acceptance an analysis showing the effect of the revisions on the entire project. The analysis shall include:

1. An updated schedule not including the revisions. The schedule shall have a data date just prior to implementing the proposed revisions and include a project completion date;
2. A revised schedule that includes the proposed revisions. The schedule will have the same data date as the updated schedule and include a project completion date;
3. A narrative explanation of the revisions and their impact to the schedule; and
4. Computer files of the updated schedule and the revised schedule sequentially numbered or renamed for archive (record) purposes.

The Engineer will provide a response within 10 days. No revision to the accepted baseline schedule or the schedule updates shall be made without the prior written approval of the Engineer.

The Engineer will request the Contractor to submit a proposed revised schedule within 15 days when:

a) there is a significant change in the Contractor's operations that will affect the critical path;
b) the current updated schedule indicates that the contract progress is 30 days or more behind the planned schedule, as determined by the Engineer; or
c) the Engineer determines that an approved or anticipated change will impact the critical path, milestone or completion dates, contract progress, or work by other contractors.

The Engineer shall be allowed 10 days to review and accept or reject a schedule revision. Rejected schedule revisions shall be revised and resubmitted to the Engineer within 10 days, at which time a new 10 day review period by the Engineer will begin. Only upon approval of a change by the Engineer shall it be reflected in the next schedule update submitted by the Contractor.

Schedule Time Extension Requests - When the Contractor requests a time extension due to contract change orders or delays, the Contractor shall submit to the Engineer a written Time Impact Analysis illustrating the influence of each change or delay on the current contract completion date or milestone completion date, utilizing the current accepted schedule. Each Time Impact Analysis shall include a schedule revision demonstrating how the Contractor proposes to incorporate the Change Order or delay into the current schedule. The schedule shall include the sequence of activities and any revisions to the existing activities to demonstrate the influence of the delay, the proposed method for incorporating the delay, and its impact into the schedule.

Each Time Impact Analysis shall demonstrate the estimated time impact based on the events of delay, the anticipated or actual date of the contract change order work performance, the status of construction at that point in time, and the event time computation of all activities affected by the change or delay. The event times used in the analysis shall be those included in the latest update of the current schedule in effect at the time the change or delay was encountered.

Time extensions will be granted only to the extent that equitable time adjustments for the activity or activities affected exceed the total or remaining float along the critical path of activities at the time of actual delay, or at the time the contract change order work is performed. Float time is not for the exclusive use or benefit of the Engineer or the Contractor, but is an expiring resource available to all parties as needed to meet contract milestones and the contract completion date. Time extensions will not be granted nor will delay damages be paid unless:

a) the delay is beyond the control and without the fault or negligence of the Contractor and its subcontractors or suppliers, at any tier; and,
b) the delay extends the actual performance of the work beyond the applicable current contract completion date and the most recent date predicted for completion of the project on the accepted schedule update current as of the time of the delay or as of the time of issuance of the contract change order.

Time Impact Analyses shall be submitted in triplicate within 15 days after the delay occurs or after issuance of the contract change order. A schedule file diskette is also to be submitted.

Acceptance or rejection of each Time Impact Analysis by the Engineer will be made within 15 days after receipt of the Time Impact Analysis, unless subsequent meetings and negotiations delay the review. A copy of the Time Impact Analysis accepted by the Engineer shall be returned to the Contractor and the accepted schedule revisions illustrating the influence of the contract change orders or delays shall be incorporated into the project schedule during the first update after acceptance.

Final Schedule Update - Within 15 days after the acceptance of the contract by the Director, the Contractor shall submit a final update of the schedule with actual start and actual finish dates for all activities. This schedule submission shall be accompanied by a certification, signed by an officer of the company and the Contractor's Project Manager stating "To the best of my knowledge, the enclosed final update of the project schedule reflects the actual start and completion dates of the activities contained herein."

Equipment and Software - The Contractor shall provide for the State's exclusive possession and use a complete computer system specifically capable of creating, storing, updating and producing CPM schedules. Before delivery and setup of the computer system, the Contractor shall submit to the Engineer for approval a detailed list of all computer hardware and software the Contractor proposes to furnish. The minimum computer system to be furnished shall include the following:

1) Complete computer system, including keyboard, mouse, 20 inch color SVGA monitor (1,024x768 pixels), Intel Pentium 350 MHz micro processor chip, or equivalent, or better;
2) Computer operating system software, compatible with the selected processing unit, for Windows 95 or later, or equivalent;
3) Minimum sixty-four (64) megabytes of random access memory (RAM);
4) A 3.2 gigabyte minimum hard disk drive, a 1.44 megabyte 3 l/2 inch floppy disk drive, 32x speed minimum CD-ROM drive, Ethernet card and 56k modem;

5) A color-ink-jet plotter with a minimum 36Megabytes RAM, capable of 300 dots per inch color, 600 dots per inch monochrome, or equivalent. Capable of printing fully legible, timescaled charts, and network diagrams, in four colors, with a minimum size of 36 inches by 48 inches (E size) and is compatible with the selected system. Capable of plotting 3 E sized sheets within one hour. Plotter paper and ink cartridges throughout the contract.
6) CPM software shall be Primavera Project Planner, the latest version for Windows 95, or later;
7) Scheduler Analyzer Pro or equivalent – a suite of programs to assist in schedule analysis, the latest version for Windows 95, Windows NT or later and,
8) Microsoft Office software, the latest version for Windows 95, Windows NT or later, and McAfee Virus software or equivalent.

The computer hardware and software furnished shall be compatible with that used by the Contractor for the production of the CPM progress schedule required by the Contract, and shall include original instruction manuals and other documentation normally provided with the software.

The Contractor shall furnish, install, set up, maintain and repair the computer hardware and software ready for use at a location determined by the Engineer. The hardware and software shall be installed and ready for use by the first submission of the baseline schedule. The Contractor shall provide 24 hours of formal training for the Engineer, and three other agents of the department designated by the Engineer, in the use of the hardware and software to include schedule analysis, reporting, and resource and cost allocations. An authorized vendor of Project Primavera shall perform the training.

All computer hardware and software furnished shall remain the property of the Contractor and shall be removed by the Contractor upon acceptance of the contract when no claims involving contract progress are pending. When claims involving contract progress are pending, computer hardware or software shall not be removed until the final estimate has been submitted to the Contractor.

Payment - Progress schedule (critical path) will be paid for at a lump sum price. The contract lump sum price paid for progress schedule (critical path) shall include full compensation for furnishing all labor, materials (including computer hardware and software), tools, equipment, and incidentals; and for doing all the work involved in preparing, furnishing, updating and revising CPM progress schedules. Also for maintaining and repairing the computer hardware and training the Engineer in the use of the computer hardware and software as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Payments for progress schedule (critical path) will be made as follows:

Interim baseline schedule accepted, then 10 percent payment for progress schedule (critical path) will be made.

Baseline schedule accepted, then 10 percent payment for progress schedule (critical path) will be made.

Monthly update schedules accepted, then 75 percent payment for progress schedule (critical path) will be made equally for each update.

Final schedule update accepted, then 5 percent payment for progress schedule (critical path) will be made.

The Department will retain an amount equal to 25 percent of the estimated value of the work performed during the first estimate period in which the Contractor fails to submit an interim baseline, baseline, revised or updated CPM schedule conforming to the requirements of this section, as determined by the Engineer. Thereafter, on subsequent successive estimate periods the percentage the Department will retain will be increased at the rate of 25 percent per estimate period in which acceptable CPM progress schedules have not been submitted to the Engineer. Retention's for failure to submit acceptable CPM progress schedules shall be additional to all other retention's provided for in the contract. The retention for failure to submit acceptable CPM progress schedules will be released for payment on the next monthly estimate for partial payment following the date that acceptable CPM progress schedules are submitted to the Engineer.

The adjustment provisions in Section 4-1.03, "Changes," of the Standard Specifications, shall not apply to the item of progress schedule (critical path). Adjustments in compensation for the project schedule will not be made for any increased or decreased work ordered by the Engineer in furnishing project schedules.

10-1.27 PIPING AND APPURTENANCES

PART 1 - GENERAL

A. Attention is directed to "Relocation and Construction of C&H Plant Utility Lines elsewhere in these special provisions.

1.01 SUMMARY.

A. Furnish all tools, equipment, materials and supplies, including all labor required for complete installation, testing, and flushing of piping and appurtenances all as shown on the Drawings and specified herein.

B. Work Includes:

1. Submittals
2. Gaskets, Bolts, and Nuts
3. Thick-wall Polyvinyl Chloride Pressure Pipe
4. Ductile Iron Pipe
5. Steel Fittings
6. Restrained Joints
7. Mechanical Couplings
8. Valves
9. Other Fittings and Specials
10. Materials for connection to existing piping and mechanical systems
11. Installation, Testing and Disinfection of Pipe

1.02 SYSTEM DESCRIPTION.

The piping systems include sewer outfall, sewer forcemain and gravity flow water pipeline. The Work includes, but is not limited to, piping for the following services:

S	Outfall Sewer
S(FM)	Forcemain Sewer
W	Water line

1.03 SUBMITTALS.

A. Submit shop and erection drawings, together with other required information specified, in accordance with these Specifications and further requirements specified in this Section.

B. Shop Drawings. Submit shop drawings, complete with material, grade, and class for all pipe, fittings, and couplings and for all joints, coatings, and appurtenances. Submit detailed catalog and engineering data sheets for all components such as couplings and rubber gaskets, and a proposed schedule for delivering and installing the piping.

C. Erection Drawings.

1. Submit complete erection drawings for all piping. On the drawings, show and identify the pipe, pipe joints, fittings, couplings, joint harnesses, and miscellaneous details.
2. Show the following information on erection plans and profile drawings:

a. Location, length, wall thickness, and type of joint for each pipe section and fitting to be furnished and installed.
b. Pipe axis station and elevation at all changes in gradient or horizontal alignment.
c. Provide the combined horizontal and vertical joint deflection at each horizontal and vertical curve or bend.

D. Erection Procedure. Supplement the installation drawings with a set of written procedures for performing the field piping installation. Cover in detail the preparation and making of the push-on, mechanical and flanged joints and couplings; measures performed to ensure integrity of interior pipe lining and exterior protective coating at all joints and couplings.

E. Protective Coating. Submit a protective coating schedule, showing shop and field surface preparations, materials, methods of application, dry thicknesses and tests for defects, as specified herein.

F. Testing and Disinfection Procedures. Submit a detailed work plan fully describing procedures for testing the piping, and arrangements for obtaining and disposing of water for the tests. Itemize the equipment for testing. Include details of bulkheads, flanges, or caps for the testing of the pipe. Include, but do not limit the details provided in the work plan to the following:

1. Location of the pipe to be tested.
2. Details of the jumper connection.
3. Source (include location) of water to be used for testing and disinfecting.
4. Whether or not pressure and leakage testing are to be performed concurrently.
5. Method and location for disposing of water used for testing and disinfecting.
6. Type and concentration of chlorine to be used for disinfecting.
7. Location of chlorine injection point(s).
8. Name, address and verification of current Environmental Laboratory Accreditation Program certification using the multiple tube fermentation process for the laboratory performing bacteriological analysis.

1.04 PRODUCT HANDLING, DELIVERY AND STORAGE.

A. General. At all times, handle pipe with equipment designed to prevent damage to the interior or exterior coating. Handle pipe with canvas or rubber covered slings only. Do not allow bare cables, chains hooks, or metal bars to come in contact with the coating.

B. Shipping. When making shipments, carefully pad all chains, cables and hold-down equipment where in contact with the pipe. When the deformation is projected to exceed one percent of the diameter, brace each end of the pipe with approved interior supports or spiders. Provide a shipping list, bill of lading, or invoice describing the items comprising the lot with all materials shipments; tag or mark pieces as listed.

C. Unloading. Unload pipe from the trucks with care, using slings as indicated above. Do not allow pipe to fall from trucks. Unload pipe using a crane or fork lift only.

D. Storage and Handling.

1. General.

   a. Store pipe sections on suitable supports to prevent damage of any kind or rolling. Store fittings on a clean surface such as pavement or gravel. Protect machined surfaces from weather, dirt and other atmospheric deterioration with membrane covers.
   b. Maintain sufficient materials on the job site to prevent impedance to the Contract schedule. Coordinate storage of materials on the site with C&H to avoid or minimize disruption of access by C&H.
   c. Damaged and unprotected or improperly stored materials will not be accepted for payment as materials on hand.

2. PVC Pipe. Deliver polyvinyl chloride pipe to the job site from the factory and store at the job site in palletized units or bundles to prevent unnecessary deflection prior to installation. Size each palletized unit to limit the stacking of pipe to not more than 750mm high or as approved by the Engineer.

Transport pipe with care to ensure that the binding and tie-down methods do not damage or deflect the pipe in any manner. Pipe bent, deflected, or otherwise damaged during shipping will be rejected. Ensure that pipe storage at the job site conforms to manufacturer's recommendations regarding protection from long-term exposure to the sun's rays.

Do not uncover or remove PVC pipe from the pallet or lay out along the trench until the bedding material is in place and ready to receive pipe.

3. Gaskets. Store gaskets in containers or wrappers which will protect the gaskets from ozone and other atmospheric deterioration.

1.05 JOB CONDITIONS.

A. Attention is directed to Sections 10-1.01, Order of Work, and 10-1xx, Obstructions, of these special provisions.
B. Tools, Supplies, and Services. Provide needed tools, supplies, and services to handle materials and accomplish Work.
C. Scheduling. Coordinate the extent of Work and available labor force so that the Work undertaken can be secured in such manner by the end of each work day and before the arrival of adverse weather that it will not pose danger to the safety of other property or to the public.
D. Safety. Provide and maintain at all times, signs, flagpersons, barricades, warning lights, ladders, railings, and other safety items needed to protect the public, work personnel and Work.
E. Disinfection and Bacteriological Testing (water line only)

1. Water required for initial filling, pressure testing, leakage testing, and chlorination of any waterline which has not passed a bacteriological test (herein referred to as an unsterile main) may be obtained from an East Bay Municipal Utility District (EBMUD) water main which has passed a bacteriological test (herein referred to as a sterile main) with the requirements of the EBMUD.
2. If a jumper connection is used for initial filling of the unsterile waterline system, vent the jumper connection to atmosphere or disconnect from the sterile main and keep vented or disconnected until after the pressure and leakage tests have been completed. Upon completion and acceptance for the pressure and leakage tests, the jumper connection may be used to facilitate the flushing and the introduction of chlorine into the unsterile pipe system, after which again vent or disconnect the jumper pipe.
3. Upon approval of the bacteriological test, complete the permanent connection between the waterline system and existing sterile mains. Clean and disinfect pipe valves, and fitting used to make the connection with a swab saturated with a 5 percent hypochlorite solution or by a means approved by the Engineer.

1.06 DRAWINGS.

For purposes of clarity and legibility, the Drawings are essentially diagrammatic to the extent that many offsets, bends, and special fittings and exact locations are not indicated. Carefully study the Drawings to determine the extent of the Work and include in the bid all necessary bends, fittings and specials to install the Work in conformance with the Contract Documents.

PART 2 - PRODUCTS

2.01 GENERAL.

A. General Requirements. Furnish all pipe, fittings, couplings, and appurtenant items which are new, free from defects or contamination, and wherever possible, the standard product of the manufacturer. Furnish pressure or thickness classes as specified or shown. Unless otherwise indicated, the size shown is the nominal pipe diameter to be furnished.
B. Length. Furnish all pipe in maximum of 6.1 meter lengths, unless indicated otherwise.
C. Joints. Furnish pipes with bell and spigot joints unless other joints are shown or specified.

2.02 GASKETS.

Comply with the requirements of AWWA C207, Section 4.1.3, except that gasket material shall be neoprene or Buna-N.

2.03 BOLTS AND NUTS.

Unless otherwise indicated, use bolts of 304 stainless steel with ANSI regular unfinished square or hexagon heads, and nuts of steel with ANSI regular hexagonal dimensions, as specified in ANSI B18.2 for wrench head bolts and nuts and wrench openings.

Furnish threaded bolts and nuts conforming to ANSI B1.1 for screw threads, coarse-thread series, Class 2A and 2B fit.

2.04 THICKWALL POLYVINYL CHLORIDE PRESSURE PIPE AND FITTINGS.

A. Pipe. Fabricate polyvinyl chloride pressure pipe and couplings in conformance with AWWA Standard C-900 for pipe sizes 120 mm through 340 mm and AWWA C-905 for sizes 350 mm through 910 mm. Furnish all pipe appurtenances by the pipe manufacturer. Random pipe lengths are acceptable. Furnish pipe and couplings conforming with the outside diameter dimensions of cast iron or ductile iron pipe. Furnish pipe and couplings meeting the requirements of the dimension ratios shown in Table 1 at the end of this Section.

B. Pipe and Coupling Joints. Furnish pipe with elastomeric-gasket bell ends or elastomeric gasketed couplings conforming to the AWWA C-900 or AWWA C-905 requirements.

Solvent weld joints are not allowed, except as approved by the Engineer on a case-by-case basis or specifically shown in the Drawings. Furnish elastomeric gaskets conforming to the requirements of AWWA C-900 or AWWA C-905. Furnish a push-on joint with the flexible elastomeric ring that provides a tight seal that will protect the line from vibration, earth movement, shock, and that compensates for the expansion and contraction of the pipe.

C. Fittings. Furnish fittings of ductile iron in conformance with AWWA Standard C-110. Furnish ductile iron fittings of minimum pressure rating Class 250. Furnish fittings of push-on or mechanical joint type for use with AWWA C-900 or AWWA C-905 pipe, as applicable. Furnish push-on fittings that are equal to “Tyton” as manufactured by the U.S. Pipe and Foundry Company or “Fastite” as manufactured by American Cast Iron Pipe Company. Furnish restrained mechanical type where restrained pipe is shown or required.

1. Cement-Mortar Lining: Except where otherwise indicated on the Drawings and herein, provide ductile iron fittings that are lined with cement-mortar in accordance with AWWA Standard C-104 (ANSI A21.4), except as further noted in these Specifications. Use Type IV cement conforming to ASTM C-150. Provide a lining thickness as specified per AWWA C-140. Apply over the cement lining a factory-applied coat of bituminous coating as specified for the exterior coating.
2. Coatings. Furnish fittings with a factory-applied bituminous coating, generally used for ductile iron pipe. Coating that does not bond firmly or shows voids or holidays shall be rejected.

D. Pipe Restraints. Restrain buried PVC and PVC to ductile iron joints in accordance with paragraph 2.06 and Table 2 at the end of this section.

2.05 DUCTILE IRON PIPE.

Furnish ductile iron pipe (DIP) lined with cement mortar or glass, as indicated in the pipe schedule, conforming to the following requirements:

A. Pipe and Specials. Unless otherwise specified elsewhere, furnish ductile iron pipe with a minimum wall thickness in accordance with Class 53 and conforming to the requirements of ANSI/AWWA Specifications AWWA/ANSI C150/A21.50 and AWWA/ANSI C151/A21.51.

B. Fittings. Furnish fittings in pipe lines rated at 121 kPa and less which conform to the requirements of ANSI/AWWA C110/A21.10 of AWWA C153/ANSI 21.53, Class 150 for 14 inches and larger sizes.

C. Lining and Coating.

1. Cement Mortar Lining. Furnish cement mortar lined ductile iron pipe and fittings which are cement lined Type II per ANSI Specification A21.4 (AWWA Cl04).

2. Coatings. Coat exterior surfaces of buried pipe with a bituminous coating per AWWA/ANSI C151/A21.51-81.

D. Joints. Furnish flanged exposed joints and buried mechanical joints unless otherwise shown on the Drawings. Conform to the requirements of ANSI A21.10 (AWWA C110) and A21.11 (AWWA C111).

E. Restrained Joints. Restrain buried joints in accordance with paragraph 2.06 and Table 2 at the end of this Section.

F. Polyethylene Encasement. Polyethylene encasement to be applied to under-ground installations shall be in accordance with AWWA Cl05.

2.06 RESTRAINED JOINTS.

A. Design.

1. Comply with requirements of AWWA C111.
2. Restrained mechanical joints shall use an integral retainer weldment, or lugged type joint with type 304 stainless steel tie rods and nuts.
3. Design restrained push-on joints to permit easy disassembly of the restraining system not requiring cutting or burning of the gasket.

B. Field Welding. When field welding of the retainer weldment is required, Contractor shall submit welder's qualifications attesting that the welder is certified by the factory to do field welding of the retainer.

C. Products.

1. Mechanical Joints. Incorporate mechanical joint restraint in the design of the follower gland to include a restraining mechanism that causes multiple wedging action against the pipe when actuated by increasing system pressure. Design device to maintain joint flexibility after installation and burial. Manufacture glands and body of ductile iron conforming to ASTM A-536. Heat-treat body to a minimum hardness of 370 BHN. Design gland dimensions compatible with standard mechanical joint bell and tee-head bolts conforming to ANSI/AWWA A21.11 and ANSI/AWWA C153/A21.53. Furnish twist-off nuts, same size as tee head bolts. Design restraint device to be suitable for minimum working pressure of 900 kPa with a minimum safety factor of 2:1. Shop coat primer and finish on restraint device, exclusive of bolts and nuts, per paragraph 3.07. Acceptable joint shall be EBAA Iron, inc., MEGALUG; or equal.

2. Push-On Joints. Manufacture gland, bolts and nuts of 60-45-12 ductile iron. Design retainers with sufficient number and size of ductile tie bolts to properly restrain against a minimum pressure of 150 kPa for sizes up to and including 450 mm and a minimum pressure of 900 kPa for sizes larger than 450 mm, both based on a safety factor of 2:1. Acceptable joint shall be EBAA Iron, inc., MEGALUG; or equal. Shop coat primer and finish on gland, exclusive of bolts and nuts, per paragraph 3.07.

D. Products for Ductile Iron Pipe.

1. Mechanical Joints.

a. Joints shall be manufactured by American Ductile Iron Pipe Company, LOK-Fast joint or MJ Coupled joint; U.S. Pipe and Foundry Company; MJ Gripper gland; or equal.

b. An alternative to the preceding joints shall be a follower gland which includes a restraining mechanism.

(1) The restraining mechanism shall grip the pipe and shall increase its resistance as pressure is increased.

(2) The gland shall be ductile iron in accordance with ASTM A536.

(3) Restraining devices shall be ductile iron heat treated to 370 BHN.

(4) Twist off nuts shall be used to ensure actuating of the restraining device.

(5) Systems using set screws as locking devices will not be acceptable.

(6) Acceptable joint shall be EBAA Iron, inc., MEGALUG; or equal.

2. Push-On Joints.

a. The restraining system shall be comprised of ductile iron locking segments inserted through slots in the bell face, providing positive axial lock between the bell interior surface and a retainer weldment on the spigot end of the pipe.

b. An acceptable alternate system shall have positive restraint against joint separation by a retainer weldment through a boltless system.

c. Restrained push-on joints shall be manufactured by United States Pipe and Foundry Company, TR Flex pipe and fittings, TR Flex gripper ring, TR Flex pipe field weldment and Field Lok gaskets; American Ductile Iron Pipe Company Lok-Ring joint, Flex-Ring joint, Fast-Grip joint; or equal.

2.07 MECHANICAL COUPLINGS.

A. General. Furnish flexible (sleeve) couplings of the full sleeve type, split sleeve type, or flanged adapter type, as shown on the Drawings, specified herein, or as otherwise permitted by the Engineer. Provide the requisite pipe flexibility without jeopardizing pipe joint integrity due to hydraulic thrust. Furnish couplings with the same pressure-rating as the pipe, with all-metal bearing surfaces. Provide galvanized steel bolts and nuts. Restrain flexible couplings unless the Engineer has given his approval to omit this feature for specific cases.

B. Full Sleeve Type Couplings. Furnish properly gasketed, hot-dipped galvanized sleeve of a diameter to fit the pipe with corrosion resistant bolts conforming to AWWA C-219.

For couplings for joining steel and iron pipe sizes, provide a steel middle ring, 2 steel followers, 2 gaskets and the necessary steel bolts and nuts to compress the gaskets. Provide Dresser Style 38, Smith-Blair Type 411, or equal. Furnish a hot-dipped galvanized (shop galvanized) sleeve for couplings to be installed underground. Do not apply galvanizing in the field.

C. Restrained Flanged Coupling Adapter. Furnish the sleeve type. The couplings shall contain anchor studs of strength adequate to hold the pipe together under a pull equal to the longitudinal strength of the pipe at a tensile stress of 138,000 kPa. Furnish couplings to be installed underground with corrosion resistant bolts conforming to AWWA C-219.

1. Provide adapter for joining steel and cast iron pipe consisting of a steel middle ring, steel followers, gaskets, and steel bolts and nuts to compress the gaskets. Furnish Smith-Blair No. 913, Dresser Style 128, or equal. Furnish couplings to be installed underground with a hot-dipped galvanized (shop galvanized) sleeve.

2. Provide adapters for joining pipe to flanged valves and fittings of the sleeve type, consisting of cast iron body and follower and steel bolts and nuts to compress the gaskets. Furnish Smith-Blair No.912, Dresser Style 127, or equal.

D. Transition Type Couplings. Provide the full sleeve type, consisting of a steel middle ring, 2 ductile iron followers, 2 gaskets and the necessary steel bolts and nuts to compress the gaskets. Furnish Smith-Blair Type 413, Dresser Type 162, or equal. Furnish couplings to be installed underground with corrosion resistant bolts conforming to AWWA C-219.

E. Flexible Flanged Coupling Adapters. Provide flanged adapters fabricated of ductile iron conforming to ASTM A-536 and having flange bolt circles compatible with ANSI/AWWA C115/A21.15. Provide restraint for the flange adapter consisting of a plurality of individually actuated gripping wedges to maximize restraint capability. Use torque-limiting actuating screws to ensure proper set of the gripping wedges. Provide flange adapters capable of minimum 3 degrees of joint deflection during assembly. Provide flange adapters having a pressure rating equal to the pipe. Couplings shall be as manufactured by EBAA Iron, Inc. Series 2100 Megaflange or equal.

F. Tapping Sleeve. Tappling sleeve body shall be 18-8 stainless steel plate. Bolts shall be 18-8 stainless steel. Nuts shall be 304 stainless steel Xylan coated. Flange shall be 18-8 stainless steel conforming to AWWA C207 Class D, ANSI 150 lb drilling. Gasket shall be Grade 33 Virgin SBR for water applications.

2.08 POLYETHYLENE ENCASEMENT.

Furnish polyethylene encasement conforming to AWWA C-105, in tube or sheet form. Furnish 5.08-cm wide tape conforming to Polyken No. 900 (polyethylene), Scotchrap No. 50 (polyvinyl), or equal for use with the polyethylene encasement. Furnish tape having an adhesive that bonds securely to both pipe (PVC or other), valve or fitting surfaces and the polyethylene film.

2.09 BACKFILL MATERIAL

Consists of excavated on-site soils except when unsuitable soils are encountered, as determined by the Engineer, in which case use Type A and Type B Backfill as specified herein.

A. Type A Backfill. Material consists of native sand having a minimum sand equivalent of 20 and of a gradation wherein 100 percent of the particles pass the 6.4mm sieve and less than 10 percent passes the 75um sieve. Conduct sand equivalency tests as required to demonstrate the adequacy of the proposed material.

B. Type B Backfill. Select granular material, either imported or manufactured from excavated on-site rocky materials. The select granular material can be imported coarse sand, imported decomposed granite or a processed material derived from the on-site excavation. Use select granular material having gradation within the following limits:

Sieve Size	Percent Finer
19mm	100
4.75	80 – 100
600um	46 – 70
150um	6 – 40
75um	0 – 20

2.10 LUBRICANT FOR STAINLESS STEEL BOLTS AND NUTS.

Furnish TRX-Synlube by Ramco, Anti-Seize by Ramco, Husk-It Husky Lube O'Seal, or equal.

2.11 CONNECTIONS BETWEEN EXISTING AND NEW PIPING.

Provide all materials required for connections between existing and new piping and mechanical systems as specified herein.

2.12 PIPE MATERIAL SCHEDULE.

The pipe material schedule is presented as Table 1 at the end of this Section. Furnish pipe as indicated in the schedule unless otherwise shown on the Drawings or specified. Pipe material listed therein shall conform to Specifications presented in Part 2 of this Section.

PART 3 - EXECUTION

3.01 GENERAL.

A. Transport pipe with care to ensure that the binding and tie-down methods do not damage or deflect the pipe in any manner. Pipe bent, deflected, or otherwise damaged during shipping shall be rejected. Handle pipe and fittings only by means of approved hooks on ends of sections, fabric slings, or other methods approved by the Engineer for the pipe and fittings used. Deliver polyvinyl chloride pipe to the job site from the factory and store at the job site in palletized units or bundles to prevent unnecessary deflection prior to installation. Size each palletized unit to limit the stacking of pipe to not more than 750 mm high or as approved by the Engineer.
B. During transport and storage, keep mortar-lined pipefittings sufficiently moist to prevent drying out of the mortar lining prior to installation. Exercise caution to ensure that PVC pipe storage at the job site conforms to manufacturer's recommendations regarding protection from long-term exposure to the sun. Do not uncover or remove PVC pipe from pallets or lay out along the ditch until the bedding material is in place and ready to receive pipe.

3.02 EXAMINATION OF THE SITE.

A. Site Examination. Examine the site, compare it with the Drawings and specifications, and determine the conditions under which the Work is to be performed. Ascertain and check the location of any existing structures, utilities or equipment that may affect the Work. No allowance will be made for any extra expense to which Contractor may be put due to failure or neglect on his part to make such examination.
B. Verification of Dimensions. Accurately determine all dimensions essential to the correct location or fit of new piping to the proper location and orientation of existing pipe or to the avoidance of obstructions or conflict with other improvements, prior to fabrication of the piping involved. Note that some adjustments in the piping configuration may be necessary to connect to existing pipes. Make all required changes from the nominal locations shown on the Drawings and include as a part of the work hereunder, after approval by the Owner.

3.03. INSTALLATION.

A. Install piping in accordance with the Drawings and the procedures and methods submitted with the approved shop and erection Drawings. Conform to or exceed the minimum requirements of the pipe manufacturer, supplemented by the provisions specified herein. Ensure that the interior of pipe, fittings, and couplings are clean and free from contamination when installed and effective means taken to prevent the entrance of foreign matter during progress of the work. Use types and sizes of pipes and fittings as specified herein and shown on the Drawings. Where fittings are omitted from the Drawings, use the same size as the piping and in all cases conform to plumbing code requirements.
B. Lay piping to the grades and alignment shown on the Drawings; ensure that all trenching, bedding, and backfilling conform to the applicable requirements of Section 19, Earthwork, and other work conforms to the following sections of AWWA Standard C600.

Section 2	"Inspection, Handling and Storage"
Section 3.1	"Alignment and Grade"
Section 3.3	"Pipe Installation"
Section 3.4	"Joint Assembly"
Section 3.6	"Valve and Fitting Installation"
Section 3.8	"Thrust Restraint"

The foregoing requirements govern the work, regardless of the type of pipe installed, unless a more stringent requirement is specified. When the work is not in progress, securely close open ends of pipe and fittings. Place the piping when weather conditions are suitable. Do not lay pipe in water. Diversion of drainage and dewatering of trenches during construction, including meeting all safety requirements, is the responsibility of the Contractor. Obtain approval from the Engineer for all pipe in place as to line, grade, bedding, and proper joint construction before backfilling. In all backfilling operations, the Contractor is responsible for preventing damage to or misalignment of the pipe.

Furnish the services of an experienced superintendent, to be constantly in charge of the erection of the work, together with all necessary qualified journeymen, helpers and laborers required to properly unload, install and connect up, clean and test the system.

C. Carefully place and support all pipe at the proper lines and grades and, where practicable, slope to permit complete drainage. Follow piping runs shown on the Drawings as closely as possible, except for minor adjustments to avoid architectural and structural features. Obtain approval from the Owner for all relocations.
D. Install all materials required for connections between existing and new piping and mechanical systems as specified herein.
E. Remove tools, equipment, rocks larger than 50mm in diameter (25mm for plastic pipe and pipe with a PVC tape coat), and other foreign matter from the pipe trench before beginning backfilling operations.
F. Joints. Install joints and couplings in conformance with the following requirements:

1. In erecting the pipe, use a sufficient number of mechanical couplings to allow any section or run of pipe to be disconnected without taking down adjacent runs. For installation of stainless steel bolts and nuts, prior to assembly, coat threaded portions of bolts and nuts with the specified and approved lubricant.
2. Take care to keep pipe in correct alignment when making joints. Use friction or lever pullers or other approved means of insuring straight pulling. The “popping-on” of joints is not permitted. Work out the fitting of piping to valves and existing piping in advance of installation, to ensure correct orientation of the mating ends and bedding of approach piping.
3. Give flanges, galvanized flange bolts, and other exterior surfaces of restrained joints and flanged couplings a protective coating in accordance with paragraph 3.07.
4. Coat sleeve type couplings with a 20 mil bituminous coating in accordance with Paragraph 3.07 before backfilling. Cover with sand before backfilling.

G. Joint Restraint. Provide joint restraint on all pressure pipelines 120 mm and larger with bell and spigot or mechanical joints, at all fittings and dead-ends, at bends greater than 10 degrees, for upstream and downstream distance as shown in Table 2.
H. Coverage. Unless otherwise shown on the Drawings, all buried piping shall have a coverage of at least 750 mm between the top of the pipe and the finished surface. Variations from the pipeline grade and alignment may be allowed to accommodate fabrication, with the approval of the Engineer. All changes of grade require the approval of the Engineer.

3.04 INSTALLATION OF THICKWALL POLYVINYL CHLORIDE PRESSURE PIPE

A. Install pipe in accordance with AWWA C900 or AWWA C-905, as applicable. Overexcavate the trench for thickwall PVC pipe to a depth of 150 mm below the bottom of the pipe and fill to the proper grade with coarse sand, thoroughly tamped. After pipe is laid, backfill the trench with sand to 300 mm above the top of the pipe. Encase ductile iron fittings in polyethylene.
B. Perform backfill and trenching in accordance with Section 19, Earthwork.
C. Pipe Laying. Carefully inspect all pipe for defects before placing in the trench. Avoid abrasion or scratching of the pipe exterior surface during installation.
D. Cutting Pipe. Whenever a standard pipe length requires cutting to fit into one line, perform work in accordance with the manufacturer’s instructions and so as to leave a smooth, square end with a beveled lip. Provide a new homing mark on all cut pipe equal to that shown on a standard pipe length. Field welds will not be permitted for gasketed joint pipe.

E. Joint Construction. Wipe all pipe joints clean of dirt, oil, grease, and other foreign material before inserting the spigot end of one pipe section into the bell end of the adjoining piece. Insert the pipe spigot end to the proper depth of the socket as indicated by the home mark.

F. Warning Tape. Bury warning tape directly over, not less than 150 mm nor more than 300 mm above the top of the pipe.

3.05 INSTALLATION OF DUCTILE IRON PIPE.

A. Pipe Laying.

1. Inspection. Do not install any pipe until it has been inspected by the Owner's representative for defects. Such inspection will include light tapping with a hammer while the pipe is suspended in the air. Do not use any pipe or fittings which are cracked or which show defects excluded by the Specifications for such pipe or fittings. Carefully repair all injuries to the protective coating of the pipe or fittings.

2. Cleanliness of Material. Carefully clean all pipes, valves, and fittings before installation. Carefully and securely plug or cap every open end of a pipe before leaving the work.

3. Positioning. For bell and spigot pipe, the position or direction of bells, which shall normally face upstream of the flow, may be altered from the positions shown on the Drawings with the permission of the Owner. Bells and spigots must be thoroughly cleaned and free from oil, grease, blisters, and excess coating before spigots are inserted into bells. Bring the spigot end of the pipe to true line and grade and insert to the full depth of the socket before the joints are made. The inner surface of the pipe shall be of uniform width and depth. If any pipe does not allow sufficient space for jointing material, replace it with one of proper dimensions.

4. Deflection. The maximum deflection in bell and spigot cast or ductile iron pipe joints, measured at the outside of the pipe, may not exceed 20 mm; the caulking space may not be less than 6 mm.

5. Anchorage. Provide restrained joints.

6. Piping Through the Walls. Where pipes pass through walls, take care to ensure that joints are watertight. Clean the pipe of all dirt and grease to secure a tight bond with the concrete.

7. Encasement. Encase all buried ductile iron pipe and fittings in polyethylene.

B. Rubber-Ring Joints. Between lengths of buried cast or ductile iron pipe, rubber gasket joints may be used. Conform to AWWA C111. Install in accordance with the manufacturer's printed recommendations. Thoroughly clean gasket seats and rubber gaskets before assembly. The completed joint shall have a uniform contact by the gasket between the outer surface of the spigot and the gasket seat of the bell.

C. Flanged Joints. Cut flanged pipe true to length. Make joints square, with even pressure upon the gaskets, and perfectly watertight. Ensure that gaskets fit the inside dimension of the pipe accurately, so that no surplus material projects out into the flow area. The completed joint shall be smooth and properly aligned.

3.06 CHANGES IN LINE AND GRADE.

In the event that obstructions not shown on the Drawings are encountered during the progress of the work that will require alterations to the Drawings, the Engineer may change the Drawings and order the necessary deviation from the line or grade. Any deviation from the specified line or grade requires approval by the Engineer. Should any deviations in line or grade be permitted by the Engineer in order to reduce the amount of rock excavation or for other similar convenience to the Contractor, all additional costs for valves, extra pipe footage or other additional costs shall be borne by the Contractor.

3.07 PROTECTIVE COATINGS.

A. Shop coat ferrous metal piping appurtenances in accordance with the following or equal systems.

Kop Coat:	893RCP epoxy primer (SP-6 surface preparation), 6 mils min. DFT; Bitumastic No. 300-M finish, 16 mils min. DFT
Tnemec:	Series 69 primer (SP-6 surface preparation), 6 mils min. DFT; Series 46H413 finish, 16 mils min. DFT

B. Field touch up wrench, handling or other damage to shop coated appurtenances and coat all buried nuts, bolts, flexible couplings, tie rods and flanges with Kop-Coat 50, Tnemec Series 46-449 (or Tnemecol 46-450) or equal compatible system, 16 mils minimum DFT. For touch up of damaged shop coating, roughen shop-coated surface to receive overcoating with 80 grit sandpaper before application.

3.08 POLYETHYLENE ENCASEMENT.

Polyethylene encase all ductile iron fittings installed as part of this Work in accordance with AWWA Standard C-105, Method A or C at the Contractor's option, and as described herein. Wrap tube seams and overlaps on the polyethylene film and hold in place by means of a 50-mm wide plastic-backed adhesive tape. Wrap seams and overlaps on the polyethylene film and hold in place by means of the specified plastic-backed adhesive tape or plastic binding straps.

3.09 TESTING AND DISINFECTION.

A. Perform hydrostatic, leakage, operational and bacteriological tests as specified herein. Testing requirements are summarized in Table 3 at the end of this section and specified below. Perform all excavation and other work required to locate and repair leaks and correct other defects which may be disclosed or develop under tests, and replace all coating, painting, backfill, or other permanent work removed in locating or repairing leaks and correcting defective piping. All gages and control devices connected to lines being tested must be disconnected for the duration of the test. Furnish and install a chart-type recording meter for the pressure tests. Submit the gage and meter used to the Engineer before and after the test, so that the Engineer may test these devices.

B. Testing Requirements.

1. Wastewater Lines, Water Lines, and Other Pressure Piping Carrying Liquids: Test waterline and sewer lines with bell and spigot gasketed joints for pressure and leakage as specified herein.

Pipe Material	Test Standard
PVC (AWWA C-900 or C-905 Pipe)	AWWA C-600

2. Pressure Pipe, Flanged or Welded Joints. Pressure test PVC, steel, cast iron, ductile iron, or other pipe material with welded, flanged, or flexible couplings and joints as specified herein. No leakage is permitted.
3. Water Lines. Give lines carrying potable water a disinfection and bacteriological test as specified herein.

C Pressure Tests.

1. General.

   a. Perform the pressure test only after the backfill has been placed and satisfactorily compacted and the general areas have been rough graded to approximately finished grade; pipe system and appurtenances have been adjusted and set to final grade and location in accordance with the Drawings.
   b. Field-test all piping, including valves, at the hydrostatic pressure indicated in Table 3 at the end of this Section, corrected to the elevations of the test gage, for two hours minimum for each pressure test, except as otherwise specified in the Pipe Testing Schedule.

2. Joint Exposure. Inspect all exposed pipe, fittings, valves, and joints carefully during the open trench tests. Correct all defects discovered by removal and replacement, as approved by the Engineer, and then retest to demonstrate satisfactory performance. Where practical, no backfilling of pipe joints will be permitted prior to the satisfactory completion of the tests in any given section.
3. Temporary Thrust Blocks. Adequate thrust restraint must be provided at the ends of pipeline sections being tested. Place temporary thrust blocks as required prior to tests and provide all necessary braces, plugs, thrust blocks, caps, flanges, and other materials to permit proper performance of the pressure testing. If concrete thrust blocks are used, do not conduct tests until the concrete thrust blocks are capable of withstanding the loads produced, and not less than 72 hours have elapsed since the last concrete thrust block was cast.

D. Leakage Tests.

1. General. Conduct leakage tests concurrently with pressure test. The lowest pressure during the leakage test shall be no less than 30 kPa below the pressure used in the pressure test. Determine the allowable leakage for pipes conveying liquids between process tankage (not subject to pumping) in accordance with AWWA C-600 Section 4.2, where, in the equation, P is the maximum pressure occurring anywhere in the pipeline. Conduct the test for not less than two hours, and measure with a calibrated suction tank that shows the amount of water required by the test pump to accurately maintain the specified test pressure. Perform all tests in the presence of the Engineer, or, if scheduling of tests is such that the Engineer cannot attend due to conflicting commitment, tests may be performed without the Engineer's presence if the Contractor obtains written permission to do so from the Engineer prior to initiation of testing. No test report will be accepted unless proof of compliance with the foregoing requirement accompanies the test report.
2. Test the pipe system by slowly filling with water from the nearest potable water source by means of a jumper pipe or other method directed by the Engineer. Load the pipe system being tested with water for at least 48 hours prior to initiating the leakage test to obtain a maximum absorption of water. Vent all air from all high spots in the system being tested before making any leakage tests.
3. Furnish pump, pipe connections, corporation stops, valves, calibrated pressure gage, measuring devices, and all other equipment, materials and labor required for performing the leakage test satisfactorily to the Engineer. Use only laboratory calibrated test gages and meters, which shall be recalibrated by a certified laboratory at the Contractor's expense prior to the leakage test.
4. Allowable Leakage.

   a. Allowable leakage for new pipe and fittings during the specified test period shall be as specified in AWWA C-600.
   b. No leakage shall be visible at flanged joints connecting new pipe and fittings to existing pipe.

5. Leakage Test Failure. Should the test of any section of the pipe system result in leakage greater than the specified limit, perform any excavation necessary to locate and repair leaks or other defects which may develop under test, including removal of backfill already placed, replace such excavated material, and perform all repairs necessary until this section is retested at a leakage within the specified allowance. If, in the judgment of the Engineer, the backfill over any section of the system has been substantially disturbed in repairing a leak, recompact the backfill and subject the material to a compaction test at no additional cost to the Engineer.

E. Disinfection Testing. Disinfect the water line system and appurtenances installed as part of this Contract in accordance with AWWA C601, except as modified herein. Perform disinfection after the leakage test has been performed and accepted. Successfully complete the leakage test on the entire system before beginning disinfection. Prior to disinfection, thoroughly flush the pipe system and appurtenances with water from the nearest source by means of a jumper pipe as specified in Paragraph 1.05E.

1. Procedure. Chlorine used for disinfection may be either liquid chlorine or hypochlorites. Do not be use tablets unless approved by the Engineer. If liquid chlorine is used, follow the method of application and precautions outlined in Subsection 2.1 of AWWA C-601, except as may be modified by the Engineer. Apply chlorine by the continuous feed method as outlined in Subsection 5.2 of AWWA C-601, except as may be modified by the Engineer. Apply chlorine at the beginning of the mechanical pipe system to be disinfected through a corporation stop installed for this purpose, through an angle meter stop, or through any other opening as may be required by the Owner. Obtain water used to convey the chlorine solution throughout the pipe system from the existing EBMUD distribution system through a temporary backflow prevented jumper pipe, or an isolated source separated by an air gap from the existing potable water system or any other approved source of supply. Control the rate of flow into the unsterile system during the application of chlorine to occur slowly. Manipulate valves to prevent the chlorine solution in the system being chlorinated from flowing back into the pipeline supplying the water. Maintain the end of the system being chlorinated open and running during the application of chlorine and until the desired chlorine concentration is reached, after which individually open each meter connection, air and vacuum release valve line and any other connection to the pipeline and flush with the chlorine solution. After the pipe system and all connections thereto have been loaded with chlorine to the proper concentration, close the water source, chlorine feeder and all other openings to the pipe system.
2. Acceptance. Maintain the chlorine solution in the system for not less than twenty-four hours, after which the treated water throughout the length of the unsterile system shall contain not less than 25 milligrams chlorine per liter of water. Test the chlorine content of the water and if it is found to be less than 25 milligrams per liter after 24 hours contact, rechlorinate the system and appurtenances and hold again for another 24 hour period. Upon approval of the chlorine residual by the Engineer, flush the chlorine solution from the system through each air and vacuum release valve. Continue flushing until the chlorine residual is not more than 0.5 milligrams per liter. In no case hold a chlorine solution of over 0.5 milligrams per liter in the system or appurtenances for more than 5 days from the initial injection to the final flushing.

F. Bacteriological Test. Following the flushing of the chlorine solution from the pipe system but not sooner than 12 hours thereafter, personnel from the certified laboratory retained and paid for by the Contractor will secure samples of the water from the system for laboratory bacteriological examination.

1. Sample Taps. Installed taps in the system for securing samples. Taps may consist of angle meter stops, piping to air and vacuum release valves, or risers to blowoffs. If in the opinion of the Engineer, a sufficient number of the above type of taps are not available, install additional temporary taps consisting of 20 mm corporation stops in the pipe system at the locations directed by the Engineer. Connect a sampling gooseneck-type pipe assembly to each tap. The sampling pipe may be copper or galvanized steel not greater than 25-mm diameter, extending at least 300 mm above ground and free of dirt, mud, or other contamination. Turn the top of the sampling pipe to project toward the street or other drainage facility. Prior to connecting the sampling pipe to the tap, flush the sampling pipe clean and disinfect with a chlorine solution containing not less than 5 percent hypochlorite solution. Perform flushing of the chlorine solution from the sampling pipe just prior to the collection of the sample.
2. Sampling. Take 2 samples, 24 hours apart, from each sampling point. The sampling line may remain in place until after the second sample has been obtained, or may be removed between samplings. If the sample pipe is left in place, cover the end of the pipe to prevent the entrance of dust or other contamination. Submit results of the bacteriological tests. Should either the first or second day's bacteriological test prove positive, that is, failure to pass the bacteriological test indicating that the mechanical pipe system is still contaminated, repeat flushing, chlorination, and bacteriological sampling as often as necessary until satisfactory results are obtained.
3. Clean-up. After the disinfection produces satisfactory results, securely close all temporary taps and remove all sampling pipes. In no case place the system in service or use water therefrom until the disinfection produces satisfactory results.

4. If a newly laid pipe system or portion thereof requires repair or replacement after chlorination due to accidental breakage, etc., perform work with extreme caution to not contaminate the interior of the undamaged portion of the system with mud, dirt, trenchwater, etc. If in the opinion of the Engineer the breakage has caused the system to become contaminated, rechlorinate and retest the system or damaged portion thereof as outlined above.

G. Contractor's Responsibility for Testing and Disinfection

1. Notwithstanding anything contained herein, the Contractor bears sole and full responsibility to construct a pipe system capable of passing the leakage test and to disinfect the system. The fact that the Engineer provides inspection during the construction and testing of the facilities shall not be cause for the Contractor to abrogate his responsibility with regard to meeting testing and disinfection requirements.
2. Prevent the consumption of water for any and all uses from unsterile pipelines whether by workmen, subcontractors, or any other person who may come in contact with the water from the unsterile systems.
3. Indemnify and save the Engineer harmless from any suits, claims, or actions brought by any person or persons for or on account of any sickness or death sustained or arising out of the consumption of water from the unsterile systems.
4. Dispose of water following completion of any test, successful or otherwise, in a manner in accordance with all local and state laws, and in particular with all requirements of the California Regional Water Quality Control Board if discharging directly or indirectly to the ocean. In disposing of water, do not cause erosion of the receiving flow channel or damage to property, private or public.

3.10 FLUSHING.

A. General. Flush all piping clean of all dirt and foreign material following completion of the hydrostatic and leakage test.
B. Equipment and Supplies. Provide all equipment, and supplies for performing the work, and waste the water at locations or by procedures approved by the Engineer. Furnish fittings and all special pipe taps required for injecting any required sterilizing solution.

3.11 CLEAN-UP.

A. Remove all excess excavated material at the end of each workday and maintain the site in a clean and neat condition. Immediately upon completion of the Work of this Section, remove all rubbish and debris from the job site and dispose of legally. The Contractor is responsible for all costs and fees associated with disposal. Remove all construction equipment and implements of service and leave the entire area involved in a neat, clean, and acceptable condition.

4.0 MEASUREMENT AND PAYMENT

All work required to conform to the requirements of this section shall be considered to be included in the contract unit prices for 500mm Water Line, 250mm Force Main Sewer, and 450mm Outfall Sewer, and no additional compensation will be made therefor.

TABLE 1

PIPE MATERIAL SCHEDULE

Service	Line Identification	Application	Size (mm)	Pipe Material and Dimension Ratio	Minimum Wall Thickness (mm) and Pressure Rating (kPa)	Joints
Outfall Sewer	S	Buried	450	PVC C-905 DR 41	12.09 689	Push-On
Force Main Sewer	S (FM)	Buried	250	PVC C-900 DR 25	11.28 689	Push-On
Water Line	W	Buried	500	Ductile Iron	11.4 1724	Push-On

Pipe dimension ratio, minimum wall thickness and pressure rating per American Water Works Association (AWWA) standards C-900 or C-905, as indicated for each service application.

TABLE 2

PIPE JOINT RESTRAINT SCHEDULE

Service	Line Identification	Restrained Length (m.)
Outfall Sewer	S	6
Forcemain Sewer	S (FM)	6
Water line	W	40

Note: Restrained length is required adjacent to all bends.

TABLE 3

PIPE JOINT TESTING SCHEDULE

Service	Line Identification	Test Fluid	Operating Pressure	Test Pressure
Outfall Sewer	S	Water	N/A	100 kPa
Forcemain Sewer	S (FM)	Water	100 kPa	150 kPa
Water line	W	Water	700 kPa	900 kPa

10-1.48 CONCRETE STRUCTURES

Portland cement concrete structures shall conform to the provisions in Section 51, "Concrete Structures," of the Standard Specifications and these special provisions.

An evaluation of the free standing tower behavior under wind loads has been performed and is included in the "Information Handout" available to the Contractor as provided for in Section 2-1.03, "Examination of Plans, Specifications, Contract, and Site of Work," of the Standard Specifications. It is known that aerodynamic oscillations may occur for certain directions of applied wind loading. The Contractor may elect to provide temporary bracing, stays, damping devices or other means of reducing the anticipated aerodynamic oscillations of the towers during construction.

General.—Structural concrete, bridge, shall include concrete used for fender and dolphin caps.

Should the Contractor elect to eliminate a portion of the tower footing forms as shown on the plans and expose portions of the cast-in-place concrete footing or footing tie-beam, the reinforcing bars which are within 300 mm of the exposed surfaces of the footing or footing tie-beam shall be epoxy-coated at the Contractor's expense. Shotcrete shall not be used as an alternative construction method for reinforced concrete members unless otherwise specified.

The first sentence of the tenth paragraph in Section 51-1.05, "Forms," of the Standard Specifications is amended to read:

> Form panels for exposed surfaces shall be plywood conforming to or exceeding the requirements of U.S. Product Standard PS 1 for Exterior B-B (Concrete Form) Class I Plywood or any material which will produce a smooth uniform concrete surface substantially equal to that which would result from the use of that plywood.

The third paragraph in Section 51-1.15, "Drains in Walls," of the Standard Specifications is amended to read:

> In addition to the drain holes and weep holes specified in the preceding paragraph, holes approximately 75 mm in diameter for relief of hydrostatic pressure shall be provided at the bottom of walls, immediately above the footing, at approximately 4500-mm centers.

Mass concrete.—Mass concrete shall be used for the locations designated on the plans and at the footing of Bent 7 Crockett Viaduct and Pier P1 footing. The Contractor shall provide an analysis of the anticipated thermal developments in the mass concrete elements for all expected project temperature ranges using his proposed mix design, casting procedures, and materials. Additionally, the Contractor shall describe the measures and procedures he intends to use to maintain a temperature differential of 20°C or less between the interior and exterior portions of the designated mass concrete elements during curing. The mass concrete mix design and the proposed plan to monitor and control the temperature differential shall be submitted to the Engineer for approval a minimum of 10 working days prior to concrete placement. The Contractor shall provide temperature monitoring devices approved by the Engineer to record temperature development between the interior and exterior portions of the elements at points approved by the Engineer. The monitoring devices shall be read by the Contractor and readings recorded at not greater than 6-hour intervals, as approved by the Engineer, beginning when casting is complete and continuing until the maximum temperature differential is reached and begins dropping. If monitoring indicates the 20°C differential has been exceeded, the Contractor shall take immediate action to prevent further increase in the temperature differential and shall make the necessary revisions to the approved plan to maintain the 20°C or less differential on any remaining placements. Revisions to the approved plan shall be approved by the Engineer prior to implementation.

FABRICATION (ORTHOTROPIC BOX GIRDER)

This work includes the fabrication and delivery to the site of weld-fabricated orthotropic box girder sections, splice plates and bolts, shear keys, and appurtenant materials, as shown on the plans.

Filler metal shall meet the mechanical properties of the base metal and the Charpy V-notch value for Zone 2.

All edges and corners of plates and profiles, which are to be painted, shall be rounded off to a minimum radius of 2 mm.

Re-entrant angles shall be cut with a rounding radius of 25 mm minimum unless otherwise noted.

Flame and plasma cutting by hand is permitted at adjustments during assembly or as approved by the Engineer, and a guiding rail or similar shall be used for the burner. The edges shall be post-treated by grinding to remove all appearance of cutting.

Materials with a thickness of 10 mm maximum may be cut by shears, provided that damages and irregularities from shearing shall be removed and the cut edge shall stand perpendicular to the surface.

The axis of bending for the formed deck ribs shall be parallel to the direction of rolling. The radius of bend shall not be less than that shown on the plans. The method of bending shall be break-press. Roll bending will not be allowed. The proposed method shall result in a formed rib free from all cracks at the ends and along the length of the bend. The first 10 ribs formed with the approved bending method shall be magnetic particle tested (MT) 350 mm out of every 3.5 m along the length of rib to verify the acceptability of the method. Longitudinal cracking occurring through the rib length will result in rejection of the rib. Minor end cracks, as determined by the Engineer, may be repaired by removing to sound metal and replacing with weld metal as approved by the Engineer.

Welding.—The third paragraph of Section 55-3.17, "Welding," of the Standard Specifications is amended to read:

> The extent of radiographic testing on groove welds shall be in accordance with the requirements in ANSI/AASHTO/AWS D1.5, Subsection 6.7.1.2. In addition, twenty-five percent of all main member tension groove welds, in material in excess of 13-mm thickness, shall be ultrasonically tested.

Table 2.2 of ANSI/ AASHTO/AWS D1.5 is superseded by the following table:

Base Metal Thickness of the Thicker Part Joined, mm	Minimum Partial Joint Penetration Groove Weld Size, * mm
Over 6 to 13 inclusive	5
Over 13 to 19 inclusive	6
Over 19 to 38 inclusive	8
Over 38 to 57 inclusive	10
Over 57 to 150 inclusive	13
Over 150	16

* Except the weld size need not exceed the thickness of the thinner part

Backing for welds that are subject to computed stress which are left in place in the completed structure shall be a single length. Backing shall be of the same material as the structural steel being welded. Single lengths of backing shall be obtained by using a continuous strip, or may consist of lengths of backing joined by full penetration butt welds. Butt welds in the backing material shall be subject to the same kind and frequency of testing as specified for the type of joint in the material being joined. Butt welds in backing material shall be ground flush as necessary to obtain proper inspection and for proper fit-up in the weld joint with which the backing is to be used.

Welding (Orthotropic Box Girder).— Intermittent welds will not be permitted unless they are shown on the plans or they are tack welds incorporated into the final weld.

Unless otherwise shown on the plans, terminations of fillet welds and stop-starts shall be ground smooth.

Steel backing where shown on the plans or required by welding procedures shall be made continuous for the full length of the weld. All necessary joints in the steel backing shall be complete joint penetration welds in butt joints meeting all the requirements of these specifications for tension flange butt welds.

The weld joining the rib to flange plates shall produce a minimum of 80 percent penetration. The rib to deck welds shall be made by a fully automatic welding process except for short lengths unable to be reached by automatic equipment and areas requiring repair. All backing shall be continuous for the full length of the weld and all necessary joints in steel backing shall be complete joint penetration welds meeting all requirements of these specifications for complete penetration transverse tension flange butt joints. Rib to deck welds shall conform to the following provisions:

Weld Procedure Qualification Test.--Notwithstanding the requirements of Section 5 of the "Bridge Welding Code," for the 80 percent penetration welds, a full scale prototype section of the rib-to-flange plate, complete with diaphragm and bulkhead plates, shall be welded in the same manner as will be used in the actual fabrication. The test sections shall be a minimum of 12.4 m in length with a minimum of 4 ribs, both sides of the rib to be welded. Should welding machines using multiple heads with the purpose of providing simultaneous welding of more than one weld at a time be used in fabrication, this same equipment shall be used in the fabrication of the weld procedure test samples. The Engineer will order the test weld to be stopped at any quarter point in its length, and the weld then restarted to duplicate a stop-start condition.

Macroetch test specimens shall be taken from both ends, the stop-start, and at three intermediate points as determined by the Engineer. Macroetch examination at these cut cross sections shall not show less than the required joint penetration and the test section shall not have defects beyond the limits specified in AWS D1.5, "Bridge Welding Code."

A mechanical properties test plate shall be made in accordance with the details specified in the Bridge Welding Code. Base metal shall be the same specification and grade used in fabrication. The test weld shall be made using the same electrode/flux combination as will be used in fabrication and the weld metal deposited using the same welding equipment and as nearly as possible the same machine settings as will be used in fabrication. The all weld metal tensile and impact test values shall meet the requirements specified for ASTM Designation: A709, Grade 50T2 steel, in Section 5 of the Bridge Welding Code.

Job Control Tests.--During the course of fabrication, job control test sections shall be provided to the Engineer. Such job control test sections shall be a minimum of 18 inches long, using the same material and welding procedure as used in fabrication. The test section shall be made as a runoff extension of an actual rib-to-deck weld. If fabrication methods and welding sequence make this impractical, the test sections shall consist of a piece of deck plate and at least one rib web plate positioned at the same inclination as in actual fabrication. If multiple head welding equipment is used, the test section shall have at least two rib plates so that two welds will be made simultaneously on the test section. Test sections shall be made for each operator and welding equipment at the beginning of each work shift. The job control test section shall be immediately evaluated. If macroetch examination of the test section indicates less than the required joint penetration, or reveals defects beyond the limits specified in Section 5 of the Bridge Welding Code, production welding may not commence or continue. Any welds made prior to an acceptable job control test for that work shift will be subject to non-destructive testing. In the event of a failed job control test production, welding shall not resume during that work shift until the necessary adjustments are made in the welding procedure to produce a passing job control test.

Welding shall be performed under conditions normally found in a closed workshop and at a temperature above 10°C. Where welding has to be performed outdoors or at lower temperatures such as during assembly and after erection, measures taken by the Contractor to assure the welding quality shall be submitted to the Engineer for approval before the welding work commences.

All welding shall be performed using qualified joints.

A weld shall not be repaired more than 2 times. If a weld is rejected after second repair, an appropriate piece of the structure shall be replaced as approved by the Engineer.

For butt joint between plates with a difference of thickness of 4 mm or more the transition must be sloped 1: 6.

Longitudinal and transverse butt joints shall be full penetration X-welds. At the Contractor’s option, the joints may be V-welds from above against powder filled or ceramic back strip. The procedure testing performed before start of the work shall demonstrate that the weld can be made to the required quality and that angular deformation caused by shrinkage of welding can be counteracted by suitable measures, particularly for V-welds.

Nondestructive Testing.--Nondestructive testing shall conform to AWS D1.5, Section 6. All welding tests will be witnessed by the Engineer. If the percentage of inspected welds, shown in the following table, taken at 6 random locations within the box girder segment fails, the Contractor shall perform the inspection testing on the entire fabricated panel at the Contractor’s expense.

Main Member (M) Primary Component (C)	Stress			Weld Type			Extent & Type of Testing
	Tension	**Comp.**	**Shear**	**CPGW**	**PPGW**	**Other**	
1. Box Girder Shell							
Transverse splice weld	X	X	X	X			100% UT
Longitudinal shop weld	X	X	X	X			15% RT or UT
Closed rib to plate	X	X	X		X		15% UT
Open rib to box plate	X	X	X			X	15% MPT
Open rib to bulkhead plate	X	X	X			X	15% MPT
Deck plate to drain plates	X	X	X	X			15% UT
Box plates to each other	X	X	X	X			15% MPT
Deck plate to joint seal assembly	X	X	X		X		100% UT
Deck plate to barrier plate	X	X	X			X	20% MPT
Deck plate transverse splice at joint seal assembly	X	X	X	X			100% UT
2. Transverse Bulkheads							
Vertical splice	X	X	X	X			15% UT
Diaphragm/rib	X	X	X	X			20% MPT
Longitudinal stiffener/bulkhead	X	X	X	X			15% UT
Vertical stiffener - bulkhead weld	X	X	X			X	15% MPT
Diaphragm - bulkhead weld	X						20% UT
3. Longitudinal Bulkheads							
Suspender conn. pin plates	X	X	X		X	X	15% MPT
Vertical splice	X	X	X	X			15% UT
Bulkhead to top/bottom plate	X	X	X	X			15% MPT
Weld to transverse bulkhead	X	X	X			X	15% MPT
4. Intermediate Diaphragm							
Diaphragm web to shell plate			X			X	10% MPT
Diaphragm to rib weld	X	X	X	X			10% MPT
Diaphragm to longitudinal bulkhead	X	X	X			X	10% MPT
Diaphragm to edge plate	X	X	X			X	10% MPT
5. Wind Tongue to Bottom Plate							
Wind tongue to shell plate	X	X	X			X	10% MPT
Wind tongue diaphragm plates			X			X	10% MPT
Wind tongue diaphragm to shell plate	X	X	X			X	10% MPT
6. Rocker Link							
Link connection plates to deck plate	X	X	X	X			15% MPT
Link connection to bulkhead	X	X	X	X			15% MPT
Diaphragm web to shell plate	X	X	X	X		X	15% MPT
Link bracket to bulkhead						X	15% MPT
7. Traveler Rail							
Rail web to bottom flange weld	X	X	X	X			10% MPT

Thermal gouging, except back gouging as part of an accepted weld procedure, may be used for repairs and only according to an approved procedure for the repair work. All gouging, including back gouging, shall only be performed by personnel with documented experience.

After the thermal gouging, slag residues shall be removed and the surfaces ground to bright metal. After grinding, the groove profile shall comply with the dimensional requirements in the repair procedure.

Tolerances (Orthotropic Box Girder).--Structural steel shall be detailed and fabricated so that dimensions shown on the plans will be obtained within the specified tolerances under full dead load (including final paving) and the cable at the level shown on the plans at a temperature of 27 degrees C throughout the erected structure. The dimensions of welded structural members shall conform to the following requirements:

Based on the fixed or reference points established by the Engineer, the Contractor shall examine the position of adjoining structures to determine deviations from the theoretically correct position. If deviations are found which exceed the stated tolerances for the adjoining structures, the Contractor shall immediately inform the Engineer and propose a procedure to the Engineer, for approval, to correct the deviation.

In the finished bridge, local deviations of the steel structure from the theoretical values shall be limited as follows:

Within a plate section of 4 m x 4 m the deviation of the steel deck from a plane surface shall be a maximum of 5 mm, the deviation being defined as the total distance between two parallel limiting planes.

For structural members primarily exposed to compressive stresses the following tolerances apply:

1. Flatness of free plate sections between longitudinal stiffeners shall be limited to 1.5 mm.
2. The straightness of longitudinal plate stiffeners perpendicular to the theoretical plane shall be limited to L/700 and L/1000, representing deviations towards the stiffeners and deviations away from the stiffeners, respectively, where L is the distance between the corresponding transverse stiffeners.

The deviation perpendicular to the box girder bottom of the transverse stiffeners of the box girder bottom shall be less than 8 mm. The deviation shall be measured from straight lines, parallel to the bridge axis, connecting the stiffeners at each side of the stiffener in question.

The inclination between the longitudinal axis of the in-fill piece and the trough shall be less than 1:100.

When supported horizontally under the influence of its own weight only, the completed sub-panels shall be in contact with coplanar supports positioned at all four corners and the center of each of the long sides.

All butt joint welding in the upper surface of the roadway deck must not protrude more than 5mm.

Off-set of plate edges shall be less than 2.0 mm.

Within the individual spans, the vertical and horizontal deviations of the girder from the theoretical alignment gradient shall be within the following limits:

+L/3000 for 15m <L<length of span

+5 mm for L < 15 m

The expected pier, anchor block, and tower leg deformations shall be considered when determining vertical position.

The overall depth of the girder shall be within +5 mm of that shown on the plans and within +3 mm of that of the adjacent section to which it will be joined. Similarly the tolerances on overall width shall be +10 mm and 5 mm, respectively.

In the completed structure, the transverse slope shall not deviate more than 1.5 percent from the specified slope.

The top line of the joint seal assemblies shall follow the theoretical transverse road profile with maximum deviation of +2/-0 mm. The longitudinal slope of the joint (lengthwise of the bridge) may deviate a maximum of 1 percent from the theoretical slope of the roadway.

The horizontal position of the joint seal assemblies shall deviate less than 10 mm from the theoretical position.

Ribs are to be held mechanically against the bottom of the deck plate, prior to and during welding, so that the maximum gap is no greater than 0.6 mm.

The deck panel shall be fabricated with excess width at all edges. The excess materials shall be trimmed using a guided torch or similar methods that produce a similar edge to that of a milled edge. Trimming shall not be done prior to completion of welding of the deck unit.

A complete fabricated panel shall be supported in the shop on a jig designed to hold the panel ends at the same elevation.

The maximum root opening for all deck plate shop butt welds shall not be greater than 0.8 mm. The maximum difference in the elevation of 2 adjacent deck plates being shop butt welded shall not be greater than 1.5 mm.

The maximum out of parallel of the deck plate sections assembled in the shop, longitudinal edges and transverse edges shall be ±1.5 mm in 3 meters and their corners shall not be out of square by more than ±1.5 mm in 3 meters unless otherwise noted.

The internal bulkhead plates inside the deck ribs shall be aligned with the support diaphragms at transverse bulkheads. The maximum out of alignment in any direction shall not exceed 1.5 mm. Suitable template shall be provided.

Fit of Contact Surfaces (Orthotropic Box Girder).--The maximum step between adjacent surfaces in a joint shall not exceed 1.0 mm.

Where there is a change in the nominal-wall plate thickness, steel packing plates with a minimum thickness of 4 mm shall be placed on the outside. All other steel packing plates shall be a minimum thickness of 2 mm.

Pre-Assembly (Orthotropic Box Girder).--The Contractor shall build an assembly template that will simulate the in-place support conditions and which will permit the check and verification of all specified fabrication tolerances of the assembled box girder sections. The layout, design and construction of this assembly template shall be subject to the Engineer's approval.

The templates shall be provided with facilities to hold the stiffeners and cross members accurately in line, position and in firm contact before welding is commenced. This shall, in general, be done by pressing the stiffeners down onto the plate, which shall be firmly supported so as to remain in contact with the template during this operation.

Box girder sections shall be fabricated in units as indicated on the plans and shall be detailed so as to provide for welded plate splices and bolted rib splices.

Box girder sections for the full width of roadway shall be preassembled in the shop, checked for match and squareness and checked also for the alignment of bolting holes in the particular location where the respective panels are to be installed.

All box girder component sections, once they leave the shop, shall be designated for specific locations.

Assembly (Orthotropic Box Girder).--The suspended structure is designed to be pre-assembled in sections of the complete box cross section generally 24.8 m long. One transverse splice within each section will be allowed during assembly.

The Contractor may alternatively propose to pre-assemble 24.8 m long sections, either to be erected individually or to be joined in pairs before erection.

On completion of each trial erection, at least one unit shall be retained to provide a basis of continuity for the next assembly, allowing adjacent units to match and fit together when erected.

Drilling of holes in the permanent structure for temporary clamping will not be allowed except as approved by the Engineer. Holes approved by the Engineer shall be drilled during shop fabrication.

A minimum of 50 percent of all box girder sections shall be completed before erection commences.

Shipment (Orthotropic Box Girder).--Method of shipment, handling and storage shall be subject to the Engineer's approval. Stacking of box girder segments will not be permitted.

The Contractor shall notify the Engineer prior to the transport of major items from the shop, assembly yard or other place.

Stainless steel shall not come in contact with surfaces of plain steel or zinc during transport or storage. If stainless steel materials are lifted, the lifting mechanism shall be wrapped with protective material to ensure stainless steel materials are not damaged.

ERECTION (ORTHOTROPIC BOX GIRDER)

The method of erection of the pre-assembled sections of the suspended structure shall be determined by the Contractor to ensure control of tower deflection, and stability against aerodynamic oscillation. The Contractor shall also ensure that the box girder is moment-free under the global design dead load, including future superimposed dead load, and temperature at 27°C.

The Contractor shall carry out dynamic analyses for the erection procedure to demonstrate the adequacy of the procedure. Details of these analyses and of any supplementary damping measures shall be submitted to the Engineer for review and approval.

Wind pressure effects during erection shall be calculated using a gust wind appropriate to a return period of not less than 10 years and shall allow for variation of speed with height. The Contractor shall provide temporary connections between adjacent sections in order to ensure high torsional stiffness and satisfactory aerodynamic stability of the suspended structure during all stages of erection. If necessary the Contractor shall provide damping devices to obtain stability against aerodynamic oscillations.

All such temporary measures shall be approved by the Engineer. The Contractor shall similarly ensure stability of the towers at all stages of erection and shall provide holdback stays or other damping devices, as necessary.

The erection procedure shall be such that the maximum stresses in any part of the permanent structure do not cause any permanent deformation or damage. Appropriate values of loads and safety factors for erection loading conditions shall be approved by the Engineer.

The details of any fastenings which the Contractor may require in any part of the permanent works for erection equipment shall be submitted to the Engineer for approval.

Immediately upon erection, each deck segment shall be attached to the suspenders and secured to the adjacent section by temporary connections. The first segments to be erected shall be stabilized by temporary hangers.

No welding shall be started at a splice until the correct relative alignment of the 2 adjacent sections is achieved, and fixed with the approved attachments.

Each steel deck segment shall be matched in the field, with its adjacent erected segment. The vertical offset between deck plate edges at the transverse deck splice shall not exceed 2 mm. The sections shall be joined together by field welding of deck plate and bolting of deck stiffeners (ribs). Optional bolted splices for the side, edge and bottom deck plate are permitted subject to the approval of the Engineer. Particular care shall be taken to ensure accurate alignment of the stiffeners and deck plate at the splice. The full penetration field welding of the transverse field splice shall be performed using an approved automatic welding process.

The Contractor shall make all provisions and sequence the construction operation to ensure that the diagonal steel members of the center tie are free of any stress, excluding the self weight stresses of the individual diagonal member, after being fully installed and connected to center tie cable band. The vertical members of the center tie shall be free of any bending stresses under the fully installed and connected condition. The vertical members may contain axial stresses resulting from dead load under the fully installed and constructed condition.

Attachments (Orthotropic Box Girder).--An ultrasonic examination for lamination shall be performed where the attachment will cause tensile stress in the thickness direction.

Attachments shall be repaired by welding with an approved SMAW WPS.

After the removal of temporary attachments, the steel surface shall be reconditioned by grinding level with the surrounding material. Scars in the surface shall be filled by welding and ground flush. Magnetic-particle examination shall be performed to ensure that the surface is free from cracks.

The sixth paragraph in Section 55-3.19, "Bearings and Anchorages," of the Standard Specifications is amended to read:

> The embedded end of anchor bolts shall be either headed or with a nut and washer, and anchor bolts shall be installed with or without either pipe sleeves or corrugated metal canisters, as detailed on the plans. The anchor bolts shall be carefully installed to permit true positioning of the bearing assemblies.

10-1.89 BRIDGE DECK DRAINAGE SYSTEM

This work shall consist of furnishing and installing bridge deck drainage system and column drainage at Bent 7 Crockett Viaduct as shown on the plans, in accordance with the provisions in Section 75, "Miscellaneous Metal," and Section 59, "Painting," of the Standard Specifications, and these special provisions.

Attention is directed to "Welding Quality Control" and "Bridge Deck Membrane Waterproofing" of these special provisions.

Scuppers shall be fabricated steel scuppers as shown on the plans.

Radiographic inspection of the welding for the assembly of the scupper will not be required. All welds for scupper assembly shall be complete penetration groove welds unless otherwise directed by the Engineer.

After galvanization of the scupper, all inside surfaces shall be coated with bridge deck membrane waterproofing.

Inlet gratings shall be ductile iron castings. The bearing surface of the inlet gratings shall be machined so that the grating has a full and even bearing on the scupper, and shall fit into the scupper without rocking.

Pipe and pipe fittings, such as elbows and tees, shall be ductile iron and shall conform to the requirements of ASTM Designation: A-377M (ANSI 21.51). All pipe and pipe fittings shall be groove cut around the full pipe circumference at both ends. The grooves shall be radius cut in accordance with AWWA C606. The grooves shall be such that a keyed housing clamp coupling shall fit into them. All joints in the pipe shall be made with groove type couplings. All pipe bends (elbows) shall be of the long radius type.

Couplings for joining pipe to pipe, pipe to fitting, or fitting to fitting, shall be ductile iron and shall conform to the requirements of ASTM Designation: A536. All couplings shall be gasketed, double keyed, housing clamps designed to lock and seal the joint between two grooved pipes, or fittings, when the housing clamp is bolted and tightened in place. The gasket shall be a molded or extruded compound of Butyl or EDPM, suitable for water service.

Hoppers shall be fabricated from steel plates.

Pipe brackets and supports shall conform to the requirements of ASTM Designation: A-575, Grade 1015 and 1020. Supports for horizontal piping shall be spaced at 1500 mm maximum. Supports for vertical piping shall be spaced 1750 mm maximum. Anchors shall meet or exceed the requirement of US government, GSA Specification No. FS-S-325 Group I, Type I, Class I. Nuts and bolts shall conform to the requirements of ASTM Designation: A307.

Prior to acceptance of the downspout system, the system shall be flushed out and tested to insure that it is flowing at full capacity. Any obstruction in the downspout system preventing the free flow of drainage or its operation at full capacity shall be removed.

All metallic portions of the downspout system shall be painted in the field in accordance with the provisions in Section 59-3, "Painting Galvanized Surfaces," of the Standard Specifications.

MEASUREMENT AND PAYMENT.—Bridge deck drainage system will be measured and paid for by the kilogram.

The contract price paid per kilogram for bridge deck drainage system shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in furnishing and installing bridge deck drainage system, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

ENGINEER'S ESTIMATE

04-013014

Item	Item Code	Item	Unit of Measure	Estimated Quantity	Unit Price	Item Total
1	016620	ELECTRONIC MOBILE DAILY DAIRY COMPUTER SYSTEM DATA DELIVERY	LS	LUMP SUM	LUMP SUM	
2	016621	TIME RELATED OVERHEAD	WDAY	1300		
3	016622	ESTABLISH MARINE ACCESS	LS	LUMP SUM	LUMP SUM	
4	016623	PROGRESS SCHEDULE (CRITICAL PATH)	LS	LUMP SUM	LUMP SUM	
5	074019	PREPARE STORM WATER POLLUTION PREVENTION PLAN	LS	LUMP SUM	LUMP SUM	
6	074020	WATER POLLUTION CONTROL	LS	LUMP SUM	LUMP SUM	
7	016624	NON-STORM WATER DISCHARGE	LS	LUMP SUM	LUMP SUM	
8	016625	TEMPORARY COVER	M2	5000		
9	016626	TEMPORARY DRAINAGE INLET PROTECTION	EA	19		
10	016627	TEMPORARY EROSION CONTROL	M2	10 100		
11	016228	TEMPORARY CONCRETE WASHOUT	EA	33		
12	016629	TEMPORARY CONSTRUCTION ROAD	M2	640		
13	074029	TEMPORARY SILT FENCE	M	5550		
14 (S)	120090	CONSTRUCTION AREA SIGNS	LS	LUMP SUM	LUMP SUM	
15	120100	TRAFFIC CONTROL SYSTEM	LS	LUMP SUM	LUMP SUM	
16 (S)	120120	TYPE III BARRICADE	EA	26		
17 (S)	120149	TEMPORARY PAVEMENT MARKING (PAINT)	M2	46		
18 (S)	120165	CHANNELIZER (SURFACE MOUNTED)	EA	75		
19 (S)	129000	TEMPORARY RAILING (TYPE K)	M	3996		
20 (S)	129100	TEMPORARY CRASH CUSHION MODULE	EA	95		

REVISED PER ADDENDUM NO. 3 DATED DECEMBER 2, 1999

ENGINEER'S ESTIMATE
04-013014

Item	Item Code	Item	Unit of Measure	Estimated Quantity	Unit Price	Item Total
21	016630	ABANDON 75 MM WATER LINE	LS	LUMP SUM	LUMP SUM,	
22	150241	ABANDON SEWER	LS	LUMP SUM	LUMP SUM	
23	150608	REMOVE CHAIN LINK FENCE	M	913		
24	150713	REMOVE PAVEMENT MARKING	M2	693		
25	150722	REMOVE PAVEMENT MARKER	EA	447		
26	150742	REMOVE ROADSIDE SIGN	EA	24		
27	150760	REMOVE SIGN STRUCTURE	EA	2		
28	150805	REMOVE CULVERT	M	13		
29	150820	REMOVE INLET	EA	5		
30	150823	REMOVE DOWNDRAIN	M	26		
31	150860	REMOVE BASE AND SURFACING	M3	2462		
32	151272	SALVAGE METAL BEAM GUARD RAILING	M	75		
33	151281	SALVAGE ROADSIDE SIGN	EA	6		
34	152386	RELOCATE ROADSIDE SIGN-ONE POST	EA	13		
35	152430	ADJUST INLET	EA	3		
36	152609	MODIFY INLET TO MANHOLE	EA	2		
37 (S)	153101	PLANE ASPHALT CONCRETE PAVEMENT	M2	210		
38	153221	REMOVE CONCRETE BARRIER	M	140		
39	156585	REMOVE CRASH CUSHION	EA	7		
40	048010	REMOVE FENDER	LS	LUMP SUM	LUMP SUM	

ENGINEER'S ESTIMATE
04-013014

Item	Item Code	Item	Unit of Measure	Estimated Quantity	Unit Price	Item Total
41	160101	CLEARING AND GRUBBING	LS	LUMP SUM	LUMP SUM	
42	016631	DEMOLISH MAINTENANCE FACILITY CONCRETE	LS	LUMP SUM	LUMP SUM	
43	016632	LEAD PAINT REMOVAL (MAINTENANCE FACILITY)	LS	LUMP SUM	LUMP SUM	
44	016633	ASBESTOS REMOVAL (MAINTENANCE FACILITY)	LS	LUMP SUM	LUMP SUM	
45	016634	ROADWAY EXCAVATION (HAZARDOUS)	M3	5930		
46	016635	ROADWAY EXCAVATION (CONTAMINATED)	M3	33 242		
47	016636	UTILITY EXCAVATION (HAZARDOUS)	M3	1685		
48	016637	UTILITY EXCAVATION (CONTAMINATED)	M3	40		
49 (F)	192003	STRUCTURE EXCAVATION (BRIDGE)	M3	4750		
50 (F)	192008	STRUCTURE EXCAVATION (TYPE A)	M3	535		
51 (F)	048011	STRUCTURE EXCAVATION (TYPE A) (CLASS I)	M3	4290		
52 (F)	048012	STRUCTURE EXCAVATION (TYPE A) (CLASS II)	M3	7340		
53 (F)	192020	STRUCTURE EXCAVATION (TYPE D)	M3	345		
54 (F)	192035	STRUCTURE EXCAVATION (ROCK)	M3	15 300		
55 (F)	192037	STRUCTURE EXCAVATION (RETAINING WALL)	M3	675		
56	016638	STRUCTURE EXCAVATION (RETAINING WALL) (CLASS I)	M3	745		
57	016639	STRUCTURE EXCAVATION (RETAINING WALL) (CLASS II)	M3	1537		
58 (F)	192049	STRUCTURE EXCAVATION (SOLDIER PILE WALL)	M3	550		
59 (F)	192055	STRUCTURE EXCAVATION (SOIL NAIL WALL)	M3	340		
60 (F)	193003	STRUCTURE BACKFILL (BRIDGE)	M3	6000		

ENGINEER'S ESTIMATE
04-013014

Item	Item Code	Item	Unit of Measure	Estimated Quantity	Unit Price	Item Total
61 (F)	048013	SAND FILL	M3	224		
62 (F)	193013	STRUCTURE BACKFILL (RETAINING WALL)	M3	1629		
63 (F)	193028	STRUCTURE BACKFILL (SOIL NAIL WALL)	M3	20		
64 (F)	193029	STRUCTURE BACKFILL (SOLDIER PILE WALL)	M3	50		
65 (F)	048014	CLASS 3 CONCRETE BACKFILL	M3	392		
66	BLANK					
67 (F)	193119	LEAN CONCRETE BACKFILL	M3	292		
68 (S)	197060	SOIL NAIL ASSEMBLY	M	2668		
69 (S)	016640	LITTER RECEPTACLE	EA	2		
70 (S)	994900	DRINKING FOUNTAIN	EA	1		
71 (S)	016641	TREE GRATE	EA	1		
72 (S)	016642	BIKE RACK	EA	1		
73 (S)	994425	BENCH	EA	6		
74	203001	EROSION CONTROL (BLANKET)	M2	2295		
75 (S)	203003	STRAW (EROSION CONTROL)	TONN	2		
76 (S)	203014	FIBER (EROSION CONTROL)	KG	495		
77 (S)	016643	FIBER ROLLS (EROSION CONTROL)	M	910		
78 (S)	016644	FIBER ROLLS CHECK DAMS	M	114		
79 (S)	203040	SEED (EROSION CONTROL)	KG	36		
80 (S)	203056	COMMERCIAL FERTILIZER (EROSION CONTROL)	KG	221		

ENGINEER'S ESTIMATE
04-013014

Item	Item Code	Item	Unit of Measure	Estimated Quantity	Unit Price	Item Total
81 (S)	203061	STABILIZING EMULSION (EROSION CONTROL)	KG	60		
82 (S)	208285	25 MM PLASTIC PIPE (PR 315) (SUPPLY LINE)	M	15		
83 (S)	208293	150 MM PLASTIC PIPE (PR 315) (SUPPLY LINE)	M	20		
84 (S)	016645	RELOCATE 100MM ELETRICAL LINE	LS	LUMP SUM	LUMP SUM	
85	250401	CLASS 4 AGGREGATE SUBBASE	M3	2005		
86	260301	CLASS 3 AGGREGATE BASE	M3	748		
87	270011	CEMENT TREATED BASE (PLANT-MIXED, CLASS A)	M3	4485		
88	290201	ASPHALT TREATED PERMEABLE BASE	M3	1036		
89	390102	ASPHALT CONCRETE (TYPE A)	TONN	21 270		
90	390180	ASPHALT CONCRETE (BRIDGE)	TONN	2320		
91	394040	PLACE ASPHALT CONCRETE DIKE (TYPE A)	M	178		
92	394049	PLACE ASPHALT CONCRETE DIKE (TYPE F)	M	20		
93	397001	ASPHALTIC EMULSION (PAINT BINDER)	TONN	13		
94	048015	DRILLED HOLE (600 MM)	M	89		
95	048016	DRILLED HOLE (915 MM)	M	280		
96	048017	DRILLED HOLE (1.2 M)	M	355		
97	048018	STEEL SOLDIER PILE (W250 X 131)	M	32		
98	048019	STEEL SOLDIER PILE (W310 X 226)	M	160		
99	048020	STEEL SOLDIER PILE (W360 X 237)	M	55		
100	048021	STEEL SOLDIER PILE (W360 X 314)	M	240		

ENGINEER'S ESTIMATE
04-013014

Item	Item Code	Item	Unit of Measure	Estimated Quantity	Unit Price	Item Total
101	048022	STEEL SOLDIER PILE (W690 X 289)	M	355		
102	490574	FURNISH STEEL PIPE PILING (NPS 16)	M	6030		
103 (S)	490575	DRIVE STEEL PIPE PILE (NPS 16)	EA	168		
104 (S)	048023	3000 MM PERMANENT STEEL SHELL	M	497		
105 (S)	048024	3000 MM CAST-IN-DRILLED-HOLE CONCRETE PILING	M	996		
106 (S)	048025	2700 MM CAST-IN-DRILLED-HOLE CONCRETE PILING(ROCK SOCKET)	M	741		
107 (S)	048026	INSTALL STATE-FURNISHED 3000 MM PERMANENT STEEL SHELL	M	499		
108	048027	FURNISH CAST-IN-STEEL SHELL CONCRETE PILING (NPS 30) (TYPE A)	M	12 565		
109 (S)	048028	DRIVE CAST-IN-STEEL SHELL CONCRETE PILE (NPS 30) (TYPE A)	EA	380		
110	048029	FURNISH CAST-IN-STEEL SHELL CONCRETE PILING (NPS 30) (TYPE B)	M	1760		
111 (S)	048030	DRIVE CAST-IN-STEEL SHELL CONCRETE PILE (NPS 30) (TYPE B)	EA	50		
112	048031	FURNISH CAST-IN-STEEL SHELL CONCRETE PILING (NPS 30) (TYPE C)	M	1300		
113 (S)	048032	DRIVE CAST-IN-STEEL SHELL CONCRETE PILE (NPS 30) (TYPE C)	EA	32		
114	048033	FURNISH CAST-IN-STEEL SHELL CONCRETE PILING (NPS 60)	M	210		
115 (S)	048034	DRIVE CAST-IN-STEEL SHELL CONCRETE PILE (NPS 60)	EA	5		
116 (S)	500001	PRESTRESSING CAST-IN-PLACE CONCRETE	LS	LUMP SUM	LUMP SUM	
117 (S)	048035	TOWER FOOTING FORM	EA	2		
118	510000	SEAL COURSE CONCRETE	M3	1332		
119 (F)	510051	STRUCTURAL CONCRETE, BRIDGE FOOTING	M3	18 400		
120 (F)	510053	STRUCTURAL CONCRETE, BRIDGE	M3	27 480		

ENGINEER'S ESTIMATE

04-013014

Item	Item Code	Item	Unit of Measure	Estimated Quantity	Unit Price	Item Total
121 (F)	510060	STRUCTURAL CONCRETE, RETAINING WALL	M3	1226		
122 (F)	510086	STRUCTURAL CONCRETE, APPROACH SLAB (TYPE N)	M3	145		
123 (F)	048036	STRUCTURAL CONCRETE (SOLDIER PILE WALL)	M3	164		
124 (F)	048037	STRUCTURAL CONCRETE (SOIL NAIL WALL)	M3	287		
125	510502	MINOR CONCRETE (MINOR STRUCTURE)	M3	22		
126	510528	MINOR CONCRETE (CAP)	M3	50		
127 (F)	048038	ARCHITECTURAL TREATMENT (TEXTURED CONCRETE)	M2	1205		
128 (S)	048039	JOINT SEAL ASSEMBLY (MR=1270 MM)	M	25		
129 (S)	048040	JOINT SEAL ASSEMBLY (MR=1000 MM)	M	25		
130	048041	MAINTENANCE WALKWAY	M2	740		
131 (S-F)	520102	BAR REINFORCING STEEL (BRIDGE)	KG	4 968 000		
132 (S-F)	048042	BAR REINFORCING STEEL (SOLDIER PILE WALL)	KG	12 000		
133 (S-F)	048043	BAR REINFORCING STEEL (SOIL NAIL WALL)	KG	25 000		
134 (F)	520103	BAR REINFORCING STEEL (RETAINING WALL)	KG	53 680		
135 (S-F)	520110	BAR REINFORCING STEEL (EPOXY COATED) (BRIDGE)	KG	283 000		
136 (S-F)	048044	WELDED HEADED BAR REINFORCEMENT	EA	1 208		
137 (F)	530100	SHOTCRETE	M3	65		
138 (S-F	048045	BRIDGE DECK MEMBRANE WATERPROOFING	M2	26 500		
139 (S-F)	550203	FURNISH STRUCTURAL STEEL (BRIDGE)	KG	12 722 000		
140 (S-F)	550204	ERECT STRUCTURAL STEEL (BRIDGE)	KG	12 722 000		

REVISED PER ADDENDUM NO. 3 DATED DECEMBER 2, 1999

ENGINEER'S ESTIMATE

04-013014

Item	Item Code	Item	Unit of Measure	Estimated Quantity	Unit Price	Item Total
141 (S)	048046	FURNISH CABLE SYSTEM (WEST CABLE)	LS	LUMP SUM	LUMP SUM	
142 (S)	048047	FURNISH CABLE SYSTEM (EAST CABLE)	LS	LUMP SUM	LUMP SUM	
143 (S)	048048	ERECT CABLE SYSTEM (WEST CABLE)	LS	LUMP SUM	LUMP SUM	
144 (S)	048049	ERECT CABLE SYSTEM (EAST CABLE)	LS	LUMP SUM	LUMP SUM	
145	048050	MAINTENANCE TRAVELER	EA	3		
146 (S)	560208	FURNISH SIGN STRUCTURE (TUBULAR)	KG	10200		
147 (S)	560209	INSTALL SIGN STRUCTURE (TUBULAR)	KG	10200		
148 (S)	560218	FURNISH SIGN STRUCTURE (TRUSS)	KG	12647		
149 (S)	560219	INSTALL SIGN STRUCTURE (TRUSS)	KG	12647		
150 (S)	561009	920 MM CAST-IN-DRILLED-HOLE CONCRETE PILE (SIGN FOUNDATION)	M	17		
151	562004	METAL (RAIL MOUNTED SIGN)	KG	700		
152	566011	ROADSIDE SIGN - ONE POST	EA	11		
153	566012	ROADSIDE SIGN - TWO POST	EA	2		
154	016646	ROADSIDE SIGN (STRAP AND SADDLE BRACKET METHOD)	EA	3		
155 (F)	048051	RRP LUMBER	M3	160		
156 (F)	570120	TREATED LUMBER AND TIMBER	M3	140		
157 (F)	575004	TIMBER LAGGING	M3	50		
158 (S)	590115	CLEAN AND PAINT STRUCTURAL STEEL	LS	LUMP SUM	LUMP SUM	
159 (S)	048052	CLEAN AND PAINT CABLE SYSTEM	LS	LUMP SUM	LUMP SUM	
160	048053	CLEAN AND PAINT SOLDIER PILE	LS	LUMP SUM	LUMP SUM	

ENGINEER'S ESTIMATE

04-013014

Item	Item Code	Item	Unit of Measure	Estimated Quantity	Unit Price	Item Total
161	650069	450 MM REINFORCED CONCRETE PIPE	M	47		
162	650075	600 MM REINFORCED CONCRETE PIPE	M	11		
163	650079	900 MM REINFORCED CONCRETE PIPE	M	10		
164	681066	150 MM PLASTIC PIPE	M	10		
165	681134	80 MM PLASTIC PIPE (EDGE DRAIN)	M	990		
166	681137	80 MM PLASTIC PIPE (EDGE DRAIN OUTLET)	M	40		
167	681501	FURNISH AND INSTALL DRAIN PIPE (HORIZONTAL DRAIN)	M	57		
168	681502	DRILL HOLE (HORIZONTAL DRAIN)	M	57		
169	681510	HORIZONTAL DRAIN CONNECTOR UNIT	M	2		
170	681592	200 MM COLLECTOR SYSTEM (HORIZONTAL DRAIN)	M	30		
171	682049	CLASS 3 PERMEABLE MATERIAL (BLANKET)	M3	3802		
172	016647	200 MM APU UNDERDRAIN (PERFORATED)	M	467		
173	016648	200 MM APU UNDERDRAIN (SOLID)	M	133		
174	690276	450 MM BITUMINOUS COATED CORRUGATED STEEL PIPE DOWNDRAIN (2.01 MM THICK)	M	9		
175	692385	450 MM ANCHOR ASSEMBLY	EA	1		
176	704189	JACKED 600 MM WELDED STEEL PIPE (6.35 MM THICK)	M	50		
177 (S)	016649	RELOCATE 450 MM PVC SEWER OUTFALL	M	69		
178 (S)	016650	RELOCATE 250 MM PVC SEWER FORCE MAIN	M	125		
179	720011	ROCK ENERGY DISSIPATOR	EA	1		
180	731502	MINOR CONCRETE (MISCELLANEOUS CONSTRUCTION)	M3	40		

ENGINEER'S ESTIMATE

04-013014

Item	Item Code	Item	Unit of Measure	Estimated Quantity	Unit Price	Item Total
181 (F)	731517	MINOR CONCRETE (GUTTER)	M	276		
182	016651	MISCELLANEOUS CONCRETE CONSTRUCTION (COLORED CONCRETE PAVING)	M2	740		
183	750001	MISCELLANEOUS IRON AND STEEL	KG	2300		
184 (S-F)	750501	MISCELLANEOUS METAL (BRIDGE)	KG	89 000		
185 (S-F)	750505	BRIDGE DECK DRAINAGE SYSTEM	KG	21 300		
186	016652	RELOCATE 500 MM WATER PIPE	M	240		
187 (S-F)	800385	CHAIN LINK FENCE (TYPE CL-1.2)	M	243		
188	800386	CHAIN LINK FENCE (TYPE CL-1.2, VINYL-CLAD)	M	525		
189	800392	CHAIN LINK FENCE (TYPE CL-1.8, VINYL-CLAD)	M	200		
190	801900	CHAIN LINK GATE	EA	1		
191	016653	DELINEATOR (CLASS I, TYPE F)	EA	25		
192 (S)	832003	METAL BEAM GUARD RAILING (WOOD POST)	M	73		
193 (S)	016654	METAL RAILING (610 MM)	M	1020		
194 (F)	833187	CONCRETE BARRIER (TYPE 27 MODIFIED)	M	2170		
195 (S-F)	048054	METAL BRIDGE RAILING	M	1060		
196 (S-F)	048055	BARRIER MOUNTED BRIDGE RAILING	M	1110		
197 (S)	016655	VISTA POINT RAILING	M	135		
198 (S)	839532	CABLE ANCHOR ASSEMBLY (BREAKAWAY, TYPE B)	EA	1		
199 (S)	839565	TERMINAL SYSTEM(TYPE SRT)	EA	4		
200	839625	CRASH CUSHION, SAND FILLED (TYPE A)	EA	24		

ENGINEER'S ESTIMATE
04-013014

Item	Item Code	Item	Unit of Measure	Estimated Quantity	Unit Price	Item Total
201	839701	CONCRETE BARRIER (TYPE 60)	M	1126		
202	839703	CONCRETE BARRIER (TYPE 60C)	M	750		
203	839705	CONCRETE BARRIER (TYPE 60E)	M	20		
204 (S)	840515	THERMOPLASTIC PAVEMENT MARKING	M2	44		
205 (S)	840561	100 MM THERMOPLASTIC TRAFFIC STRIPE	M	5415		
206 (S)	840563	200 MM THERMOPLASTIC TRAFFIC STRIPE	M	60		
207 (S)	840564	200 MM THERMOPLASTIC TRAFFIC STRIPE (BROKEN 3.66 M - 0.92 M)	M	238		
208 (S)	840568	100 MM THERMOPLASTIC TRAFFIC STRIPE (BROKEN 3.66 M - 0.92 M)	M	40		
209	016656	300MM THERMOPLASTIC TRAFFIC STRIPE (SOLID 3.66M - 0.92M)	M	51		
210 (S)	016657	PAINT TRAFFIC STRIPE (2-COAT, 200MM)	M	466		
211 (S)	016658	PAINT TRAFFIC STRIPE (2-COAT, 100MM)	M	4546		
212 (S)	016659	PAINT TRAFFIC STRIPE (2-COAT, 100MM - BROKEN)	M	130		
213 (S)	016660	PAINT TRAFFIC STRIPE (2-COAT, 200MM - BROKEN)	M	355		
214	850100	PAVEMENT MARKER (REFLECTIVE-SPECIAL TYPE C)	EA	78		
215 (S)	016661	PAVEMENT MARKER (TWO-WAY YELLOW REFLECTIVE - SPECIAL TYPE D)	EA	6		
216 (S)	850101	PAVEMENT MARKER (NON-REFLECTIVE)	EA	2956		
217 (S)	850103	PAVEMENT MARKER (REFLECTIVE-SPECIAL TYPE G)	EA	892		
218 (S)	850104	PAVEMENT MARKER (REFLECTIVE-SPECIAL TYPE H)	EA	621		
219 (S)	048056	LIGHTING AND ELECTRICAL SYSTEM	LS	LUMP SUM	LUMP SUM	
220 (S)	048057	NAVIGATIONAL LIGHTING, AVIATION LIGHTING AND FOG DETECTION SYSTEM	LS	LUMP SUM	LUMP SUM	

ENGINEER'S ESTIMATE

04-013014

Item	Item Code	Item	Unit of Measure	Estimated Quantity	Unit Price	Item Total
221 (S)	048058	TOS AND CALL BOX SYSTEM	LS	LUMP SUM	LUMP SUM	
222 (S)	016662	TRAFFIC OPERATIONS SYSTEM	LS	LUMP SUM	LUMP SUM	
223 (S)	016663	CCTV CAMERA	EA	2		
224 (S)	016664	PAN AND TILT UNIT	EA	2		
225 (S)	016665	VIDEO ENCODER UNIT	EA	2		
226 (S)	016666	CAMERA CONTROL UNIT	EA	2		
227 (S)	016667	INTEGRATED SERVICES DIGITAL NETWORK TERMINAL ADAPTER	EA	2		
228 (S)	016668	MICROWAVE VEHICLE DETECTION SENSOR	EA	5		
229 (S)	016669	DIAL UP MODEM	EA	1		
230 (S)	016670	CONDUIT LAYOUT	LS	LUMP SUM	LUMP SUM	
231 (S)	016671	EXISTING ADMINISTARION BUILDING (MODIFICATION)	LS	LUMP SUM	LUMP SUM	
232 (S)	016672	NEW SUBSTATION CONDUIT LAYOUT	LS	LUMP SUM	LUMP SUM	
233 (S)	016673	NEW SUBSTATION BUILDING EXTERIOR ELEVATIONS	LS	LUMP SUM	LUMP SUM	
234 (S)	016674	NEW SUBSTATION GROUNDING ELECTRODE CONDUCTOR SYSTEM LAYOUT	LS	LUMP SUM	LUMP SUM	
235 (S)	016675	NEW SUBSTATION GROUNDING ELECTRODE SYSTEM LAYOUT	LS	LUMP SUM	LUMP SUM	
236 (S)	016676	NEW SUBSTATION LIGHTNING PROTECTION LAYOUT	LS	LUMP SUM	LUMP SUM	
237 (S)	016677	NEW SUBSTAION COMMUNICATION & CONTROL POWER CONDUIT LAYOUT	LS	LUMP SUM	LUMP SUM	
238 (S)	016678	PLC AND FCS LAYOUT, SCADA SCREEN AND SCADA DATA POINTS	LS	LUMP SUM	LUMP SUM	
239 (S)	016679	COMMUNICATION MISCELLANEOUS ITEMS	LS	LUMP SUM	LUMP SUM	
240 (S)	016680	NEW SUBSTATION BUILDING POWER CONDUIT LAYOUT	LS	LUMP SUM	LUMP SUM	

REVISED PER ADDENDUM NO. 3 DATED DECEMBER 2, 1999

ENGINEER'S ESTIMATE

04-013014

Item	Item Code	Item	Unit of Measure	Estimated Quantity	Unit Price	Item Total
241 (S)	016681	NEW SUBSTATION 12.47KV AND 480/277V CONDUIT LAYOUT	LS	LUMP SUM	LUMP SUM	
242 (S)	016682	NEW SUBSTATION OVERHEAD CONDUIT, FIRE ALARM AND SECURITY SYSTEM LAYOUT	LS	LUMP SUM	LUMP SUM	
243 (S)	016683	NEW SUBSTATION LIGHTING AND RECEPTACLE LAYOUT	LS	LUMP SUM	LUMP SUM	
244 (S)	016684	BRIDGE SECTIONS VIEW	LS	LUMP SUM	LUMP SUM	
245 (S)	016685	EXIISTING AND NEW FOG, NAV, AND AVA. CHANNEL LIGHTING AND CABLE LAYOUT	LS	LUMP SUM	LUMP SUM	
246 (S)	016686	ROADWAY LIGHTING AND SIGN ILLUMINATION	LS	LUMP SUM	LUMP SUM	
247 (S)	016687	CALL BOX SYSTEM (MODIFY)	LS	LUMP SUM	LUMP SUM	
248 (S)	016688	PATHWAY LIGHTING	LS	LUMP SUM	LUMP SUM	
249 (S)	016689	HIGHWAY LIGHTING (STAGE CONSTRUCTION)	LS	LUMP SUM	LUMP SUM	
250 (S)	016690	CALL BOX SYSTEM (STAGE CONSTRUCTION)	LS	LUMP SUM	LUMP SUM	
251 (S)	048059	SEISMIC MONITORING ELECTRICAL SYSTEM	LS	LUMP SUM	LUMP SUM	
252 (S)	048060	SECURITY SYSTEM	LS	LUMP SUM	LUMP SUM	
253 (S)	991065	MECHANICAL WORK	LS	LUMP SUM	LUMP SUM	
254	016691	RELOCATE BACKUP GENERATOR AND TRASH ENCLOSURE	LS	LUMP SUM	LUMP SUM	
255 (S)	048061	BUILDING WORK (SUBSTATION)	LS	LUMP SUM	LUMP SUM	
256 (F)	017174	STRUCTURE EXCAVATION (TYPE D) (CLASS I)	M3	453		
257 (F)	017175	STRUCTURE EXCAVATION (TYPE D) (CLASS II)	M3	475		
258 (F)	048009	DRILLED HOLE (760 MM)	M	96		
259	495167	FURISH CAST-IN-STEEL SHELL CONCRETE PILING (NPS 30)	M	2380		
260 (S)	495168	DRIVE CAST-IN-STEEL SHELL CONCRETE PILING (NPS 30)	EA	64		

REVISED PER ADDENDUM NO. 3 DATED DECEMBER 2, 1999

ENGINEER'S ESTIMATE

04-013014

Item	Item Code	Item	Unit of Measure	Estimated Quantity	Unit Price	Item Total
261	190101	ROADWAY EXCAVATION	M3	1150		
262	731501	MINOR CONCRETE (CURB)	M	131		
263	999990	MOBILIZATION	LS	LUMP SUM	LUMP SUM	

TOTAL BID: _____

REVISED PER ADDENDUM NO. 3 DATED DECEMBER 2, 1999